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ROBERT F. GOODMAN

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THE DEVELOPMENT OF A SYMPTOM ANALYSIS FLOW SHEET FOR THE NAVAJO COMMUNITY HEALTH MEDIC PROGRAM[1]

By

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DEDICATION

to my wife

INTRODUCTION

In attempting to develop flow sheets for the work-up and disposition of common symptoms for use by the Navajo Community Health Medic Training Program, it became apparent that the breadth of experience necessary for consideration of the many facets of the problem were more than could be found in one man, and the task was of such magnitude that it could not be completed in one step. Such an undertaking could be best done by a group of practicing physicians with experience in treating the Navajo people in various specialties. For this reason my efforts have been re-directed toward producing a guide for those physicians who will be called upon to develop or modify flow sheets.

As background, I will first discuss the envisioned role of the flow sheet in the CHM program. The advantages and disadvantages of adapting methods developed for other flow sheets and computer diagnosis will then be analyzed while noting the unique features of the Navajo culture which limit the application of these methods in the CHM program. I will then offer some suggestions for the form and content of the flow sheets based on these considerations. I will discuss in detail reasons for beginning each flow sheet with a data base of general information; for quickly identifying emergency

situations with a checklist of relevant signs and symptoms; and for ordering the pattern of flow with a system of symptom sub-headings. Afterwards I will consider problems in dealing with the medical specialties of psychiatry and pediatrics in designing flow sheets. I will then describe the future forms flow sheets may take and close with a discussion of inherent deficiencies which limit in the usefulness of flow sheets in clinical medicine.

THE C.H.M. PROGRAM

There are currently two programs for the training of C.H.M.'s for the Indian Health Service--one in the Tucson area, and one in Gallup. The Tucson program is training ten American Indians from various tribes for assignments on reservations throughout the country. The Gallup program is specifically for the Navajo area. Twenty medics are being trained here (13 are Navajo) to man clinics on the Navajo reservation only. Trainees in both programs have all had extensive medical experience as L.P.N.'s, R.N.'s, laboratory and x-ray technicians, or Army medical corpsman.

Training

Both programs consist of two years of supervised training. (The Navajo program began several months after the Tucson program, on April 5, 1971). "During the first 3 months, (the trainees) received intensive academic training in the basics of anatomy and physiology; the principles and techniques of patient care; obtaining histories; performing physical examinations; emergency treatment; diseases common to the Navajo; laboratory and x-ray techniques; clinical procedures; mental health; public health education; and medical and dental records." (1) In addition to continuing their classroom activities, for the remainder of their first year they

will receive training in the outpatient department and inpatient services of the Gallup Indian Medical Center. During their second year of training, they will obtain further clinical training and experience under the direction of a preceptor who will be a senior physician in the Indian Health Service.

Assignments

At the completion of his training, a medic may be assigned to a field health station on the Navajo reservation, where he will serve as a means of extending the delivery of first-line outpatient health services to remote areas of the reservation. Some medics may be assigned to work directly with a physician in a medical facility where they can relieve the physician of certain medical tasks to allow the physician time for specialized medical services. In either role, the medic, because he is an Indian, will be able to communicate and relate to his patients in a way that no anglo doctor can. The Navajo medics will also understand their people's customs which are so intimately related to health. (2)

The Navajo medic, living and working in a remote clinic, can adapt more easily to a mode of living that a university-trained physician might find intolerable. However these same attributes which make the Indian medic so well suited for his role as health

provider to his people, may also create special challenges in his training and his work in the field. These problems will be discussed specifically in the context of how they influence the development of the flow sheet.

THE FLOW SHEET

Specifications

The flow sheet will be one of three parts of a "C.H.M. Manual", which is to "serve as a clinical guide to diagnosis and treatment as well as referral. This manual also should be used as a tool for communication between the C.H.M. and his supervising physician, in order for concise recording of the procedures, treatments, and referral patterns that the physician desires the C.H.M. to implement. In this respect, the Manual will serve as a book of standing orders after the supervising physician signs each procedure." (3) In addition, the flow sheet (at least for the Navajo project) is envisioned as a teaching tool to be used as a model for a way of thinking about the work-up of a patient beginning with presenting symptoms.

Another important function of a flow sheet is a legal one, as the right of a medic to legally dispense medicine is a subject of controversy. The flow sheet will provide a set of standing orders,

approved by a M.D., that will lead to an accepted disposition on which the C.H.M. can rely as a legal document of the correctness of his actions (whether he decides to seek immediate consultation, refer the patient, or treat and follow the patient). At least twenty flow sheets covering the most commonly seen symptoms on the reservation are envisioned.

The second and third parts of the manual are references for the flow sheets and will include information on medications, emergency procedures, listings of available resources, administrative responsibilities and referral procedures.

The responsibility for devising the rough draft of flow sheets for the Tucson C.H.M. program was delegated to a group of several first year medical students from the University of Arizona. The students worked from June 1, 1971 to August 31, 1971, under the supervision of Dr. Karl R. Reinhard, D.V.M., Ph.D., at the Health Programs Systems Center (HPSC) in Tucson. The basic outline of their flow sheets was directed as:

"1. Symptom or Diagnosis (e.g. Diarrhea, Diabetes)

2. Key

   A. Questions to ask

   B. Physical findings to ascertain

   C. Simple laboratory tests to do and order

3. Procedures to follow: (select one)

   A. Treatment and follow-up by the medic

   B. Immediate consultation with a physician

   C. Delayed consultation or referral" (3)

The students admirably completed the rough draft of 29 flow sheets by August 31, 1971. (4)

One of the methods of this paper will be to constructively evaluate these rough drafts to aid in the development of flow sheets more suitable to the Navajo C.H.M. program.

Background of Navajo Flow Sheet

My qualifications for attempting such an evaluation come from my experiences in trying to develop similar flow sheets specifically for the Navajo program. The students in Tucson were working to develop flow sheets to be used on reservations throughout the country, and since the problems that the Navajo medics will face are in many ways unique to the Navajo people (I will elaborate later) the directors of the Navajo C.H.M. Program thought that it would be more suitable for their medics to have a group of flow sheets of their own. It was to be my task to develop these flow sheets.

To prepare for this task, I reviewed the rather extensive literature which has arisen over the past decade concerning the

translation of a physician's logic in making a differential diagnosis into computer programs.(5 - 17)

I also reviewed the not-so-extensive literature on aspects of differential diagnosis more directly applicable to flow sheets (18 - 26), and some of the more conventional literature on differential diagnosis. (27-36) Two additional aids were a series of flow sheets published over the last few years in Patient Care magazine and flow charts from the Automated Military Outpatient System (AMOS) of the Army Medical Department. (37) Also, I discussed problems in developing flow sheets for the Navajo C.H.M.'s with many physicians at the Gallup Indian Medical Center (Drs. Ogden, Bennett, Fleming, and Posner), from Yale (Dr. Kimball) as well as the people working for the Phoenix C.H.M. Program, expecially Dr. Reinhard and his students.

OTHER FLOW SHEETS

The Patient Care flow sheets were designed for use by a physician and as such are too sophisticated in the use of technical language and in the subtleties of differential diagnosis for the adoption by the C.H.M. Program. It must be remembered that the Navajo flow sheets will deal with the twenty or so most common oupatient problems which

account for about 90% of the diseases on the reservation (plus the life threatening problems that should be considered). Diagnostic problems will be referred to a consultant physician.

The AMOS flow sheets go to the other extreme. The AMOS medic is more a triage officer. Working in an Army hospital he can quickly direct the patient to the proper consultant or department. For this reason, the AMOS flow chart usually ends with a referral after a rough identification of the type and severity of a problem. The Navajo flow chart must put some emphasis on treatment, since the medic in a remote clinic on the reservation must be more self-sufficient. In addition, both the AMOS and Patient Care flow charts depend on many diagnostic laboratory and x-ray aids that will not be available to the Navajo medic. The Tucson C.H.M. flow chart, since they also are designed for medics on reservations, avoid these problems for the most part; and so are more suitable as points of departure for the Navajo flow charts.

STATISTICAL BACKGROUND

While the Tucson flow sheets were developed for use by all tribes, their designers chose to consider only those "presenting symptoms that would point toward resolution of the 20 most common health problems (specifically) on the Papago reservation." (4) (See Appendix I) From past experience in reviewing the literature on

gall bladder disease among Southwestern Indians, I have learned that it is not necessarily valid to extrapolate findings from one tribe to another. (38)

It was, therefore, necessary to learn what were the most common symptoms presenting in the Navajo outpatient clinics. I first consulted the computer tabulations of diagnoses given for all outpatient visits to the PHS clinics in the Navajo area. I reviewed the 3/4 year period from July 1, 1970 to March 1971, first for the entire Navajo area and then for each of the eight service units into which the reservation is divided by the Navajo Indian Health Service. I then ranked the diagnoses which accounted for over 1,000 visits throughout the area during this 3/4 year period (Appendix II). These ranged from upper respiratory infections, which accounted for 20,657 outpatient visits to diabetes mellitus, for which 1,134 visits were made to the clinics. (By comparing Appendix II with Appendix I, although the diagnostic categories differ somewhat, it can be seen that the prevalences of different diseases between the Navajos and Papagos are, indeed, different).

The Navajo area ranking was then checked against the ranking of diagnoses for each of the Navajo service units to estimate whether the medics sent to the different districts would be seeing the same prevalences of the different diseases. The ranking of the top

fifteen to twenty-five diagnoses for each service unit were compared to the ranking of that diagnosis in the area (Appendix III). It was noted whether the diagnosis a) has the same rank in both (eg. 5th in both); b) appears within three ranks in both lists (eg. 12th in one, 14th in the other); c) is more than three ranks apart (eg. 12th in one, 18th in the other); and d) is ranked very differently in both lists. Each service unit has about 3 or 4 examples of large discrepencies from the area order (d). However, most of these differences could be explained by the presence or absence of a specialist at the service unit (eg. refractive errors and female genitourinary problems in Winslow). Therefore, it was assumed that the prevalence of diseases among the service units is about the same.

SYMPTOMS AMONG THE NAVAJO

At this point I was still dealing with diagnoses rather than symptoms, so I made a table where the ordinate was the list of the most common diseases seen in the area plus some diseases not in the ranking, but seen fairly commonly in the outpatient departments. On the abscissa were listed any symptoms common to these diseases (Appendix IV). By placing an X in all boxes where the disease and the symptoms matched, it was then possible to read from the chart which symptoms commonly accompany a given disease,

and more importantly for my purposes, what common diseases should be considered for any presenting symptom listed. The symptoms which were present in the most diseases (usually in three or more diseases), were the ones first considered to head flow sheets.

Symptom Complexes

The concept of starting a flow sheet with a symptom perhaps appears intuitive to the medical mind. The Patient Care and AMOS flow sheets begin this way, most probably because the symptom is what brings the patient to the physician. It is part of hospital doctrine to begin a write up with the chief complaint. However, the use of a symptom as a starting point in the CHM flow sheet is, perhaps, more the result of the fortunate choice of Dr. Reinhard as supervisor to the students working at HPSC. Dr Reinhard has devised a system for the health surveillance of isolated communities using local non-professional manpower to gather data. He found that by using a system of reporting illness by symptom complexes, these people could accurately define the epidemiological pattern of illness in an Eskimo community over a prolonged period of time without spending great effort in learning the details of differential diagnosis. (39) While the Indian medics will be far more than data collectors, the premise that symptom analysis (along

with signs and simple laboratory data) can be used to evaluate health problems by less sophisticated auxillary medical personnel, remains valid. A symptom with its designated modifiers provides detailed and specific information about a health problem without ever having to consider diagnostic categories. An example of a symptom and its modifiers developed by Dr. Reinhard is as follows:

DISCHARGE:	Continuous	Profuse	Watery	Bloody	Locator Code
	Intermittent	Modest	Mucoid	Yellow-white	(Anatomical site)
	Occassional	Scant	Purulent	Yellow-green	
	Recurrent		Membranous		
			Crusty		
			Frothy		
			Scabbing		

Problems in Using Symptom Complex Method

There are a few problems with the exclusive use of the symptom complex method in construction of a flow sheet for the Navajo CHM program. First of all, some of the descriptor terms are too difficult for the average Navajo trainee to master. One of the differences between the Tucson and Gallup CHM programs is the level of cultural sophistication in the two groups. Tucson trainees are generally more acculturated than the Navajos. This is partly due

to differences in the selection criteria in the two programs. It was felt by the Navajo CHM selection committee that while less acculturated trainees would have less facility with the white man's language and culture he would have more facility with his own and, after all, this is what makes the CHM program so attractive. While the Navajo trainee might have more difficulty mastering his job than his Tucson counterpart, once the job was mastered, he would be more useful in the field, since he could relate to the ways of his people more easily than an anglo or a more acculturated Indian. The end result would be better health delivery to the Navajo people.

One of the things sacrificed to achieve this end was the mastery of a large technical vocabulary. While the first year medical student has familiarity with those medical words which have lay meanings (eg. "membranous" in the above example of modifiers), the Navajo trainee has no such peg on which to hang such a medical word. Instructors soon realized that time spent teaching technical words by rote could be better utilized. Also most technical language can be replaced by a more mundane synonym anyway (eg. on-and-off=intermittent; a great deal of, much=profuse; pus=purulence).

Another problem unique to the Navajo trainee is the language he will be using to communicate with his patients. It will be

difficult to obtain the precision in description for which the symptom complex system is designed when translation into Navajo is necessary. Most Navajo patients would prefer to speak in their native tongue, whether because they lack competence in English or because of cultural pride. Navajo, although a very exact language, is not a technically precise one. For example the words heart and lungs are the same in Navajo (ā'-jā), as are the words for blue and green (dō'-c·lǐzsh). The Navajos can circumvent confusion among themselves with additional descriptors. (For example, one Navajo might say to another that the pills he took were "dō'-c·lǐzsh", like Hosteen Begay's truck). Each additional description may lead to confusion, however.

One may attack the use of symptom complexes by professionally trained people from the opposite side. That is, that the advantage of technical terms is that they succinctly carry a great deal of information. For example, a physician could say the patient has a continuous yellow-white, purulent discharge from the vagina, or he could say she has leukorrhea. Not only is the latter term shorter, but this single word calls forth in the doctors' mind the information about its possible causes and treatments that were learned along with the term as a student. Another example is the diagnostic term diabetes mellitus and its classical symptom complexes. I think that this latter argument holds for retaining

diagnostic terms in the medical schools, but for the reasons unique to the Navajo CHM discussed in the former argument, terms used for the Navajo flow sheet should be kept as simple as possible.

THE DATA BASE

The mention of a symptom automatically suggests to a physician basic questions that he would like answered to gain more information about the problem, and from which he can work to get more specific information. The medics are being taught to think in this same way, and the flow sheet should reflect their learning.

In deciding the form and content of this part of the flow sheet several considerations must be taken into account. Are there general questions of history, physical, or lab data which can help to establish the groundwork for thinking about the problem, or is it necessary to narrow the possibilities by collecting specific information before we can gather meaningful data? On one extreme the medic might perform a complete history and physical on a patient no matter what the symptom (medical student style); on the other extreme he would gather no such background but proceed through a series of specific questions to rule in or out specific diagnoses. Although the former extreme is perhaps ideal, if the experience of

physicians in the field clinics on the reservation is any indication, the medic will not have enough time for a complete history and physical on each patient. The latter extreme allows the medic to throw himself quickly into the details of the problem but carries a high risk of missing important information. The method of the Tucson manual is to include both of these extremes.

Tucson Group's Method

In the manual, flow sheets of each symptom are preceded by a series of specific questions. The medic is instructed (by Appendix V) to run through these questions on each patient presenting with the given symptom unless there is an emergency, in which case the medic is to go immediately to the flow sheet. (The problem of how the medic will decide that there is an emergency without asking preliminary questions will be considered later). After consulting this "History of Present Illness" type check list, the medic is instructed to go through check lists on past history, family history, systems review, and physical exam. (See Appendix V) The use of these latter check lists is a fine idea for a patient's first visit to clinic and can be used for the medic's reference on that patient's subsequent clinic visits. However, going through each check list on each visit is impractical. Indeed the circum-

vention of such an expenditure of time is one reason for having a flow sheet.

Let us return to the check list which asks specific questions on a symptom. An example is given in Appendix VI for the presenting symptom of diarrhea or constipation. While all the questions are valid for elucidating the cause of the symptom, many might be better asked later in the body of the flow sheet. Other questions are too specific and may be more valuable if asked in a general way, allowing the patient to answer in his own words. The same objections can be raised with the physical exam. Some of the questions and procedures listed have, no doubt, been added to elicit whether the situation is emergent or not. The medic, however, is instructed to omit this check list in an emergency. (See Appendix V).

Suggested Data Base

A better way, which falls somewhere between the two extremes discussed, might be to include a data base at the beginning of each symptom flow sheet, to be considered whether the situation is emergent or not. This could be followed immediately by a list of signs and symptoms that if present will classify the situation as emergent (more on this later). A data base would ask the information that would be important no matter what the cause of the symptom might finally be. More specific questions, which become relevant as a

group of diseases becomes more probable, could be considered in the body of the flow sheet rather than stabbing in the dark at the outset. It is also important that the data base be well-organized. In Appendix VI questions concerning duration of the diarrhea are scattered throughout the list. While this device may be used to check the patients' historical reliability, it may also confuse both the patient and the medic. It would also be remembered that the language should be kept simple in the data base, as well as the other parts of the flow sheet.

A more satisfactory example of a data base for diarrhea or constipation might be as follows:

Data Base

- When did the symptom begin?
- What are the changes in bowel habits?
- Have you had symptoms like this before?
  - What did you do?
  - What happened?
- Do any relatives or friends have similar symtoms?
- What medicines or drugs are you taking?
- Have you eaten any foods which might make you sick?

Physical:

- Vital signs T, P, R, BP
- 1) Inspection 2) Auscultation 3) Percussion
  4) Palpation, of abdomen
  findings:
- Rectal - findings:

Lab:

- Gross inspection of stool - findings:
- Occult blood } if considered necessary
- Microscopic exam of stool } if considered necessary

This example may require more intellectual responsibility on the part of the medic, but he will be thoroughly trained in such thinking.

HANDLING THE EMERGENCY SITUATION

A flow sheet must reflect the duties that the CHM will perform. Most of the CHM's work will be in dealing with day to day care of his patients' minor health problems and in the practice of preventative medicine. He must also be able to rapidly spot the emergency situation so that the disposition of the patient can be carried out as quickly and efficiently as possible, whether it be immediate evacuation, consultation, or maintenance until evacuation is possible. This is a very different situation from the work-up and treatment or referral of routine complaints. An emergency situation, however, may present as a routine complaint and the flow sheet must alert the medic to this possibility for each applicable symptom. For this reason it was decided that each flow sheet should be divided into emergent and non-emergent problems.

The former problems should be laid out in a way that could be rapidly reviewed and identified. The non-emergent problems (which could be subdivided further into those problems that would require referral electively, and those problems that the medic could treat and follow by himself), would be considered after an emergency was ruled out. They could then be approached with less haste and in more detail.

The Tucson students chose to include emergencies in the body of the flow sheet along with the more routine problems. There are advantages and disadvantages to both ways of dealing with the problem. I think I can show however, that separating the emergencies in some manner, is more efficient and less dangerous.

A "Case History"

To do this, let us consider the hypothetical case of a 50-year old Navajo man, Hosky Benally, who had just returned to the reservation after resigning from his job as foreman in a Los Angeles tool and die plant, because he could no longer tolerate the pressures of his work. His wife convinced him to drive the 20 miles to the clinic after she noticed him vomiting violently. The medic, following the Tucson manual instructions (Appendix V), found the Nausea and Vomiting check list, (Appendix VII), and asked all the questions. Hosky's only affirmative response was to the question on whether he

had had nervousness and insomia. (He answered the first question on abdominal pain, in the negative). The suggested pelvic exam and pregnancy tests were omitted for the obvious reason. Check lists of past history, family history, and review of systems were run through but were non-contributatory, except that Mr. Benally said he was told he had an ulcer 3 years ago by the plant M.D. He was put on a bland diet, but he gave it up after a few eeks. The physical exam revealed a rigid, tender abdomen. The medic then turned to the Nausea and/or Vomiting flow sheet (Appendix VIII), which he would have done immediately according to the instructions of Appendix V had he intuitively decided the situation was emergent. The Nausea and Vomiting flow sheet had him take vital signs again. He then elicited a history of recent hematemisis. On asking the patient again whether he had abdominal pain, Hosky, who had grown more frightened by his problem, answered yes. The medic turned to the Abdominal Pain flow sheet, (Appendix IX) and asked the questions indicated. The answers led him along the path marked by the dotted line in Appendix IX to the possibility of perforated ulcer and the recommendation that he send the patient to a physician immediately. (That is, if no red herrings or lack of classical symptoms diverted him from this path on the way - I shall deal with this later). The point of this little story is that a

great deal of valuable time could be wasted when the emergencies are fitted in among the non-emergent problems in the flow sheet.

The Emergency Section

An alternative method, which could save time in emergencies, is presented now. First, a data base under the Nausea and/or Vomiting flow sheet would ask some very general questions: history and description of symptoms present as to onset, duration, frequency; description of vomitus; are there other symptoms - pain, diarrhea, etc? - describe; history of similar symptoms in others; history concerning use of medicines, alcohol, or smoking; vital signs; a physical examination of abdomen, (maybe chest and neurological also); and examination of vomitus and/or stool. Immediately after this data base would come the emergency section, headed by the warning to the medic that if all of the following could not be ruled out, he should seek immediate consultation or referral and maintain the patient in the prescribed manner, if necessary. Under this heading might be a list of possible emergent diagnoses each followed by a brief description of classical accompanying signs and symptoms (and perhaps lab findings). These could be subdivided by headings linking the main symptom of the flow sheet with other important symptoms.

(eg. nausea and/or vomiting with abdominal pain

nausea and/or vomiting with diarrhea

nausea and/or vomiting with headache, etc.)

In the above case history the medic would turn to the Nausea and/or Vomiting flow sheet, go through the data base to establish basic information and then proceed to the emergency section. Under the sub-heading of "nausea and/or vomiting with abdominal pain", he would see a list of diagnoses with their symptoms including perforated viscus as follows:

Perforated viscus:

- Sudden onset, severe epigastric pain
- Tender, rigid, board-like abdomen
- Hx peptic ulcer

The purpose of using diagnostic terms rather than symptoms in this section would be in the ability of diagnoses to immediately link in the medic's mind the information he has gathered on the patient and possible etiologies. The difficulty in listing diagnoses and including in them under subheadings is in creating too much complexity in the flow sheet.

Problems With a Separate Emergency Section

The advantages in shunting the medic from one flow sheet to

another, as is done with Nausea and/or Vomiting to Abdominal Pain in the Tucson flow sheet example above, is to cut down the amount of information, (and thereby one source of complexity), that a single flow sheet contains. An argument against this is that the concept of symptom subheadings can be used to advantage as a means of patterning the flow within a flow sheet. This will be discussed later.

A point in favor of the Tucson flow sheets' method of mixing all degress of urgency together is that the logic used in analyzing symptoms need only be run through once. Dividing the consideration of problems into emergent and non-emergent referall problems requires that the same framework be repeated at least once after the emergency section, (which I shall call section I); twice if the non-emergent referral problems, (section II), are separated from the problems the medic will treat himself (section III). For example, problems which have major symptoms of Nausea and/or Vomiting with abdominal pain, must be considered under that subheading in each of section I, section II, and section III, whereas, in the Tucson flow sheet, the heading of Nausea and Vomiting with abdominal pain need only be met once.

An Emergency Identification Checklist

I think there is a compromise solution which borrows the best from both ideas: after the data base, the emergency section should be a check list of symptoms and signs, any of which, if present, indicates an emergency. Such a list can be surprisingly short while still being inclusive. A list for Nausea and/or Vomiting could be:

1. Signs of shock, dehydration, acidosis, coma, (perhaps these signs should be enumerated)
2. Blood in vomitus, or stools
3. Fecal vomitus
4. Visible peristalsis
5. Absent bowel sounds
6. Distended or rigid abdomen
7. Rebound tenderness or guarding
8. Palpable mass
9. Severe pain anywhere in abdomen, CVA, groin
10. Acetone breath and/or hx diabetes
11. Headache and elevated bp, edema, papilledema, blurred vision
12. Hx poisoning
13. Hx head, abdominal trauma
14. Severe chest pain, dyspnea, low bp

Perhaps the check list should have some kind of order in the items, whether it be most frequent symptoms first, most ominous first, easiest to rule out first, etc. The items may also be grouped in some way that will make their observation easier to perform and remember.

This check list is different from the one in the Tucson manual in that all questions are directed toward an emergency, and they are to be run through in all cases (unlike the Tucson check list which is omitted in an emergency). Once all the signs and symptoms in the emergency check list have been ruled out, non-emergent problems can be considered. Perhaps sections II and III should be merged to work more like the Tucson flow sheet but without the emergency situations. In this section (II-III) there would be more time to follow logical pathways and to perform procedures. In effect this plan would emphasize rapid identification of the problem in emergencies, and then emphasize the investigative and procedural responsibility of the medic in the non-emergent situations, for which he will be better equipped. I would like to discuss the design of the non-emergency oriented part of the flow sheet next.

THE USE OF STATISTICS IN DESIGNING A FLOW SHEET

The basic unit of operation of a flow sheet wheter it is designed for a computer program or a manual of standing orders, is

that a question is asked and if it is answered one way, one outcome becomes more probable, and if answered another way, another outcome becomes more probable. The problems considered here are in deciding what questions are to be asked and, when the answer is received, in determining quantitatively what the probability of an outcome will be.

The Use of a Computer in Diagnosis

The questions asked in medical diagnosis are concerned with the presence of symptoms, signs or laboratory data. The problem of evaluating statistically the consequences of their presence or absence is considered extensively in the literature on the applicability of the computer as an aid in the diagnostic process. This is not as oblique to the subject of flow sheets as it may seem. It is envisioned that all the information acquired in the work-up of a patient will someday be programmed into the computer. Working from a memory bank containing statistics on the likelihood of different diseases given the symptoms, signs, lab results found to be present the computer will print out a list of diagnoses to be considered. It will also suggest what questions the physician or medic is to ask next, and then it will refine its differential diagnoses on the basis of this newer information. This process continues until a specific diagnosis becomes eminently probable.

The storage of an individuals patient's health data including clinic visits, established diagnoses, medications and procedures performed is already a reality in selected populations (e.g. Papago Indians living in the Sells service unit). Collection of this information will be an immense aid in compiling health statistics, as well as providing better care to the individuals. It is envisioned that some day the Navajo medic will utilize a computer to store information on his patients.

However the suggested utilization of the computer in differential diagnosis is a reality only in very specialized cases--e.g. the evaluation of thyroid disease (8, 14), congenital heart defects (5, 17), bone (12), and hematological diseases (11). This is because it is only in these specialized fields, with their more limited sets of signs, symptoms, procedures, and differential diagnoses which need to be considered, that the acquisition of enough statistical data is feasible.

Baye's Theorem

The basic statistical computation for each step in the mathematical approach to differential diagnosis is in finding the probability of a given disease or group of diseases once a given symptom, (sign or lab result) is known to be present. In its

simplest form this equation, (Bayes theorem) is expressed as:

$$P\ (di/sj) = \frac{P\ (di)\ P\ (sj/di)}{\Sigma P\ (dk)\ P\ (sj/dk)}$$

P (di/sj) = probability that a patient with a particular group of symptoms sj has a particular disease di

P (di) = probability or incidence of a particular disease di in the population under consideration

P (sj/di) = probability or incidence of the patients' symptoms sj in the particular disease di

P (dk) = probability of each disease in the total population under consideration

P (sj/dk) = probability or incidence of the patients' symptoms sj in each disease dk (45)

I think a discussion of the subleties of the derivation and application of this formula would be superfluous in this discussion. I will direct those who would like to become more acquainted with those statistics and their use to refer ences 5, 7, 10, 12, 13, 14, 17, 19, 21, 23, 24, 25, 26, 45, 49. Let it suffice to say here that to attain meaningful values for terms such as P (sj/di) and P (sj/dk) requires the compilation of a volume of data that is not available at this time. Computer storage of health data will certainly help, but the volume is not now sufficient to develop a statistically valid flow sheet (i.e. one using Baye's theorem at each step), designed for general use by the medics on the reservation (or anywhere, for that matter). For example, the probability

of the occurrence of every symptom complex a medic encounters must be known for every disease he must consider, that is P (sj/dk) must be known for each step of the flow sheet.

Collecting Statistics on Symptoms

Very few studies directed toward the collection of such statistics have been attempted. It requires a large sample population and a great deal of computer time. One such study was undertaken by Pipberger et al. to determine the discriminatory ability of various signs, symptoms and lab tests associated with chest pain to differentiate heart disease from pneumonia. In other words, they were determining the P (sj/di) of the symptoms studied, for the heart disease and pneumonia. To achieve a valid statistical sample they administered questionnaires containing 249 "yes-no" questions to 1238 patients from 5 VA hospitals. All subjects had presenting complaints of chest pain, and all had documented diagnoses of heart or lung disease. Keep in mind that this study relates only to the one symptom heading of chest pain, and only a few etiologies are considered. For statistically valid flow sheets a similar study would be necessary for every symptom heading and all possible causes.

While all the results of this study are not entirely relevant to the present argument, several offer important suggestions for

the construction of a flow sheet. One result showed that certain symptoms, signs, and laboratory tests had little or no value in discriminating between M.I. and pneumonia. These included more general symptoms like palpitations, fatigue, insomnia, and such specific items as radiation of the pain. The point here is that while the total information to produce statistically valid flow sheets is not yet available, as studies are made collecting this data, each study can provide valuable information for planning a flow sheet. A few of the tables of the Pipberger study are included in Appendices X and XI as examples of information useful to the designer of a flow sheet.

Of course one must be careful in extrapolating data from one population to another, especially from such dissimilar populations as VA patients with chest pain and Navajos. However until large scale studies on symptomatology among the Navajo is undertaken, extrapolation is justifiable.

One such Navajo study that I am aware of, was done by Sampliner and O'Connell(41). They collected information on 237 patients who eventually had bilary tract surgery (188 were Navajos), and analysed the symptoms present in each case. Their results were as follows:

Symptoms	% of Time Presenting
pain	88.6
nausea & vomiting	49.8
fatty food intolerance	33.3
radiation of pain	16.5
jaundice	10.5
Signs	
tenderness	53.2
fever	19.4
guarding	15.6
jaundice	5.9
weight loss	1.7

Obviously information of this type would be valuable in constructing flow sheets for use by the Navajo CHM. However until more statistics are available a person designing a flow sheet must rely heavily on his personal experience.

Deciding on the Use of Lab Tests

Another job of the flow sheet (and computer of the future) should be mentioned briefly at this time. Once, a given result is known a certain disease or disease group is more probable. However, the flow sheet does not merely indicate this fact but instead directs

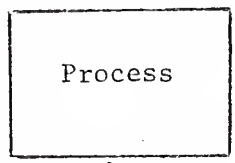
the user in a course toward that disease by suggesting a new sign or symptom to be obtained or procedure to be performed in order to narrow the possibilities. If it directs the user to elicit a new symptom or sign, the process discussed above is repeated. But if the flow sheet directs the user to perform a laboratory test, more than the statistics of P (di/sj) is implied. A test involves weighing the cost to the patient both in time inconvenience and pain against the value of the information that can be acquired. This should include consideration of the medic's competence at performing the procedure and evaluating the results. Computer programs have been theorized that make this decision also (10) but until they become a reality the designer of a CHM flow sheet must do without the computers assistance in selecting laboratory tests.

PATTERNING THE FLOW OF THE FLOW SHEET

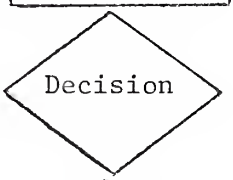
Difficulties With the Use of Symbols

Now that the basic units of decision making in the flow sheets have been discussed, I will discuss how these units might be put together to establish a pattern of flow. An examination of Appendices VIII and IX will illustrate the pattern used by the Tucson students. They have borrowed the forms of system engineers to

construct the flow sheets. These forms, recommended by the International Organization for Standardization in their Draft Recommendation on Flow Chart Symbols for Information Processing, include:

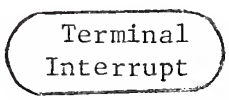


"Any processing function, defined operation(s) causing change in value, form or location of information.



A decision or switching-type operation that determines which of a number of alternative paths followed.

Exit to, or entry from another part of the chart.



A terminal point in a flow chart-start, stop, halt, delay, or interrupt, may show exit from a closed subroutine.

Flow line" (42)

The reason for the use of these symbols by a systems engineer is clear: the shape indicates the type of procedure that they contain. However, to the non-systems engineer, (eg. the CHM) who has not been trained in their use, the symbols impart no such information. The CHM could, of course, be familiarized with their meaning. However, there are other problems in their application to the CHM flow sheet. In the non-medical applications, the information contained within the symbol is usually only a few words at the most.

However, in a medical flow chart this information may be several symptoms and their specific modifiers. As is seen in Appendices VIII and IX some of the symbols, especially the decision diamond, are crowded with words to the point of illegibility. The rectangle seems to be a more functional shape for a medical flow chart (see Patient Care flow charts). Since the symbols convey no essential information to the medic, perhaps the rectangle can be universally used as the information carrying form.

Avoiding Visual Confusion

Another, more basic, problem with the form of the Tucson flow chart is that it is confusing. Perhaps a systems engineer can quickly decipher the logic, but to this analytic mind, it is difficult to follow some of the logic. At least an equal degree of difficulty in following such a flow sheet is expected to be experienced by the Navajo medic. Instructors training them have found that it is difficult to convey information to them in the form of graphs. This method of visually depicting the relationship between the change in one parameter with respect to another parameter is second nature to the college trained anglo. However, it is foreign and confusing to the Navajo medic trainees. Whether this is simply due to the unfamiliarity with this method of presenting information or whether it is related to a difference

in the logic systems of the two cultures, can only be guessed. It does indicate, anyway, that a visually complex flow sheet might confuse the medic rather than simplify his job. For this the pattern of flow of the flow charts should be kept as simple as possible. There are several ways that this can be accomplished.

Organizing by Symptom Sub-Headings

In the discussion on dealing with the emergency situations, the main concern was to take the emergencies out of the body of the flow sheet so that they may be identified quickly. A secondary advantage to this method is that it significantly reduces the number of pathways (and therefore, the complexity) of the flow sheet. As discussed previously, the Tucson students' method of shunting the medic from one symptom flow sheet to another reduces the information contained in any one flow sheet. It was pointed out, however, that this can waste time and can itself be a source of confusion. I suggested at that time that an alternative method would be to use other important symptoms, not as shunts to other sheets but as a method of organizing the pattern of flow. Further ordering could be accomplished by symptom sub-headings, proceeding from more general to more specific symptoms and signs (carefully avoiding those that are too general or specific to have discriminatory value). As an example let us consider a flow sheet for diarrhea.

Sub-headings for the different categories of non-emergent problems might be as shown in Appendix XII. This system of sub-heading can go a long way in describing a problem. However, more specific data must be determined before a diagnosis can be established. In thinking about organizing a flow sheet for Abdominal Pain, for example, it is possible to categorize a problem by accompanying symptoms (eg. abdominal pain with nausea and vomiting, abdominal pain with diarrhea, etc.). Alternatively one could further categorize the problem by a more detailed description of the pain--its intensity, time course, radiation, referral etc. However, with the diseases that present with abdominal pain both the accompanying symptoms and the details of the pain are variable enough so that either way of categorizing alone could lead to a wrong diagnosis. In this case perhaps the combination of the two systems of categorizing abdominal pain might be more specific yet less misleading with one system providing a supplement and a check on the other.

Problems with Increasing the Specificity of Symptoms

There are problems with symptoms that are too specific, however. First they increase complexity; second, as questions become more specific, the reliability of the patients history decreases. This is especially true with chronic problems when patients are asked to describe the symptoms of previous attacks. (43) The

politeness of the Navjo people also reduces the reliability of their histories, for example by telling the doctor what they think he would like to hear. The stoicism of the men (as illustrated in "Hosky Benally's case history") and the Navajo conception of the methods of a proper healer also reduce historical reliability. Afterall a good medicine man tells the patient what his problem is; he does not need to ask the patient.

Both the Tucson students' flow sheets and the plan illustrated in Appendix XII run into problems not only when the historical reliability of the patient is in question but also if there are symptoms in addition to the ones classically described; or if there are some symptoms, which classically are present, lacking. (These problems are multiplied when a translator is interposed between the patient and medic). Unfortunately these cases are common in clinical medicine. One solution to the problem is to make it possible to switch from a pathway once it becomes apparent that the problem being considered is not included in that pathway. For example, in Appendix XII, if the patient with diarrhea says he also has nausea and vomiting, but it becomes apparent that he does not have any of the problems under the nausea and vomiting heading, the arrows direct the medic to go on to the other categories. This might seem like a waste of time, but it must be remembered that

emergency problems have already been considered by the check list and ruled out, so the medic has more time to work with these non-emergent problems.

A more difficult problem is the patient who lacks a symptom he should have, whether he refuses to mention it or it hasn't appeared in the natural history of the disease. This problem could be solved by having arrows pointing back to other categories of disease, once the "proper" category has been ruled out. This also adds to the complexity of the flow sheet. A better way to avoid this latter problem might be to include diseases only under symptom headings which are almost always present in the early stages of the disease.

Details of differential diagnosis and exceptions to general rules should be omitted in the flow sheet. The designer should be dogmatic rather than ambiguous. This is one way to avoid serious confusion and keep the flow sheet simple. The flow sheet cannot be infallible; it cannot take every case into account; but it can direct the medic in most instances to keep him from committing serious mistakes by commission or omission.

Shunting Between Flow Sheets

There are other features of the plan shown in Appendix XII that are designed to guide the medic. It should be noticed that some of the symptom headings are capitalized. This is to remind the medic that separate flow sheets are available on these symptoms. This serves two purposes. First if the medic does not find a description of the problem he is dealing with under the correct category on one flow sheet it might appear under the same category in the flow sheet headed by the capitalized symptom. (If the flow sheets are planned well this should not happen often, however). More importantly the capital letters indicate to the medic, in the case of Abdominal Pain in Appendix XII for example, that if he goes to the Abdominal Pain flow sheet there will be more detailed information on the symptom of abdominal pain (its character, radiation, etc.) as it presents in the problem he is considering. This helps serve the teaching objective of the flow sheets. While there will be duplication of diseases among the flow sheets, each symptom flow sheet should emphasize the aspects of its heading symptom in defining the diseases contained in it.

Treating Non-Emergent Problems

It should be recalled that in Appendix XII non-emergent problems are divided into two categories Class II and Class III.

Class I problem signifies an emerg ency and is considered in the check list; Class II problems require consultation and/or referral to a physician; and Class III problems are treated and followed by the medic himself. In addition, Class II and III problems (unlike Class I problems) are considered as diagnoses. With Class II problems the diagnostic term serves as an exact reference to the problem that the medic can use when communicating with the consultant physician.

Threre should also be an appendix in the CHM manual listing these diagnoses and giving the medic information on considerations relevant to each diagnosis including, if applicable, instructions for the maintenance of the patient until referral. For Class III problems this appendix should also include prescribed treatments for each diagnosis. (If the flow sheet designer does not wish to use diagnostic terms, he can use a reference number or some such symbol to represent a given symptom complex in this appendix). One advantage to collecting treatment and maintenance information in an appendix is to make the flow sheet less cluttered. Instructions of treatment may be too detailed, in many cases, to be included in the body of the flow sheet itself. Such considerations as capability of the relative caring for the patient or the availability of transportation to and from the clinic might

recommend one form of treatment over another, and therefore should be mentioned in the appendix. An interesting disposition might be suggested for a case of a diagnosed functional complaint in which the medic might best refer the patient to a medicine man who specializes in such problems.

It might be decided to avoid altogether specific prescriptions and treatment regimens in the early stages of designing the flow sheets. Each medic will, no doubt, learn different details of treatment from his preceptor. There is no reason to confuse the issue by including another treatment regimen in the flow sheet. It may be best to include only the more general aspects of a given treatment in the appendix. The medic or his preceptor can fill in the details later. (It may also be a good idea to have a general rule that if a patient returns unimproved after being treated for a Class III problem, the medic will be instructed to reconsider the problem and, if necessary, reclassify the problem to Class II).

Choosing Signs and Symptoms

Before leaving the discussion of the plan outlined in Appendix XII, I should discuss the section of the flow sheet reserved for the more specific signs and symptoms used to rule a diagnosis in or out. Choosing the contents of this section for each problem

will be difficult. Signs and symptoms should not be so specific that if the case in question does not conform exactly to what is given, the problem will be ruled out, nor should they be so general as to make it difficult to distinguish one problem from another. One approach to this problem would be to list for each problem all the signs and symptoms which can exist for that problem. The medic could then be instructed that if a certain fraction of the list are present the following diagnosis is to be considered correct. (See the paper by Lipkin on the Likelihood Concept in Differential Diagnosis (21) for details of a method for deciding this fraction). If such a practice is adopted the weighting of importance of each sign or symptom must also be considered in some way. This would lead to increased complexity. The best approach would probably be for the designer of the flow sheet to be selective of signs and symptoms for their ability to discriminate between the diseases being considered on the basis of his clinical experience or the clinical investigations of others.

The Position of Lab Tests

Another important consideration for this section is where in the flow pattern should laboratory tests be included. Should they be considered along with the signs or symptoms in deciding upon a

diagnosis, or should they be reserved as confirmatory procedures once the diagnosis has been decided upon? The problem with the former method is that the results of the test may not be ready for several days. Treatment or referral would have to be instituted in many cases before the results were in anyway. As discussed before, a test requires some type of cost (i.e. time, pain, risks, etc.) to be paid by the medic or patient. The medic must decide whether the finding of signs and symptoms merits a test to be done. For example, should tonometry be done on every patient over 40 years old who complains of eye pain, or should tonometry be done only after the presence of eye pain, infected cornea, temporary blurred vison, and edema of the lids has made the diagnosis of glaucoma very probable. Obviously there is no universal solution for this problem. The designer of the flow sheet must decide for each test in each problem where to include the test in the flow sheet pattern.

DEALING WITH SPECIALTIES

I would like to consider now approaches to the two specialties of psychiatry and pediatrics in designing a flow sheet. The basic question in this discussion will be: should the diseases considered in these specialties be included with the other etiologies

of a given presenting symptom or are the differential and/or work-up of diseases in these specialties different enough to merit flow sheets of their own?

Psychiatry

In considering psychiatry, I would like to refer to a paper by Bain and Spaulding (44). These investigators used a system of symptom codes in order "to obtain numerically weighted differential diagnoses for common symptoms." The chief complaints of 500 consecutive new outpatients at Toronto General Hospital were considered. Al subjects were from lower income groups and were over 14 years of age. Clinical problems were those of general medicine excluding surgery, obstetrics, and dermatology. With the aid of a computer, Bain and Spaulding were able to tabulate the presenting symptoms with the etiology of those symptoms. The etiologies were defined by the involved system. Some of these tables are listed in Appendix XIII. One must be careful in extrapolating these results to the Navajos, but trends in the Canadian patients should at least be considered in Navajo patients. The most striking finding in these tables is the large percentage of each symptom that could be attributed to psychiatric causes. Aside from the more obvious emotionally based symptoms of nervousness,

(85% psychiatric cause), and fatigue (50%), it is interesting to note that 28% of the complaints of abdominal pain, 22% of the complaints of back pain, 26% of the complaints of chest pain, 10% of the complaints of dyspnea, 53% of the complaints of headache and 40% of the complaints of dizziness had psychiatric etiologies. These results should suggest to flow sheet designers that flow sheets headed by the above symptoms, at least, should include consideration of psychiatric problems. Perhaps separate flow sheets could be included for more conventional presentations of psychiatric disease, such as depression. Organic diseases which could result in thought and behavior disorders should be considered in these flow sheets also.

The form of the specifically psychiatric flow sheets will probably be different from the flow sheets headed by symptoms which are not usually considered of psychiatric origin. Psychiatry is perhaps the medical specialty whose system of logic in deciding on the cause of symptoms is the least easily translated into flow sheet form. Indeed it may only be possible to identify psychiatric emergencies with the flow sheet, using a section I Type checklist of ominous symptoms.

Pediatrics

The basic problem in dealing with pediatrics in the flow sheets is in deciding the degree of separation necessary in considering pediatric and adult problems. There are several points at which the designer of a flow sheet can divide the two. At one extreme, it may be necessary to consider as symptoms for heading pediatric flow sheets, symptoms not considered in adults. For example failure to thrive is a common presenting symptom complex in children. A flow sheet under this heading would concern the pediatric age range exclusively. Other symptoms might be best considered using separate flow sheets for adults and children. For example, the symptoms of diarrhea and constipation have causes and treatments different enough in adults and children to merit separate flow sheets. The flow sheets of some symptoms may only require a separate section for pediatric problems. For example, dysuria in children should be considered a Class II problem with greater emphasis on ruling out congenital defects in the urinary tract than in adults. Other symptoms such as sore throat should have a section where childhood exanthems are emphasized. Some symptoms may require separation only in the appendix of treatments, where medication or dosages are different for the same disease in children and adults. Other symptoms perhaps, may not require any

separation at all in considering pediatric and adult cases.

There is another more general consideration in favor of separation in the flow sheets of pediatric and adult age groups. Over 50% of the Navajo population is in the pediatric age range, and therefore constitute a major proportion of the patient load. Because of this, some of the CHM's may be assigned to work solely with children whether it be in assisting a PHS pediatrician in clinic or working with a nurse at a boarding school. Separate pediatric flow sheets would probably be more efficient for these medics' purposes.

FUTURE DEVELOPMENT OF FLOW SHEETS

It is envisioned that the flow sheet will pass through many stages of modification. Physicians will hopefully use the suggestions developed in this paper to modify the Tucson students rough draft or develop plans of their own. These in turn will be field tested by the medics and their preceptors and again modified where necessary.

Computers

I would like to consider the various forms which the flow sheet may ultimately take. One of the original incentives for developing the CHM program was a proposal that remote clinics on

the reservation could be linked to computers and consultants at large medical centers via closed circuit, satellite relayed, television transmission. It was envisioned that a medic could present difficult cases to a consultant hundreds of miles away by television. Also with this system, the medic could punch a symptom into his computer terminal and thus activate a program developed for the work-up of that symptom. The computer would ask the medic for relevant signs, symptoms and lab data visually on the medics TV screen. The medic would type out the results and a computer would proceed along one pathway or another depending on these results. Hopefully by the time such a system were developed the statistical basis for the computers decisions would be available for programming.

Manuals

Until such a sophisticated system becomes a reality (if ever), there are several practical forms that the information on a flow sheet might take. The simplest form is a manual of flow sheets and appendices. The contents should be arranged for quick and easy location of the correct symptom heading. Individual flow sheets should be laid out to be as visually interesting and comprehensible as possible. One way to do this might be to use color

coding--eg. red for the Class I check list, blue for Class II problems, and green for Class III. Signs and symptoms of greater discriminating power could be printed differently than less important ones. Laboratory tests could be printed differently than signs and symptoms etc. Perhaps slides of the flow sheets could be projected or viewed through a hand held device. This would magnify the contents for greater legibility. All flow sheets slides could be carried in order on a carousel.

Work Book

Another suggestion is to have the flow sheets mimeographed so that each medic has a stack of flow sheets for each symptom. The flow sheets would be in work book form, with a box beside each step to check the presence or absence of signs and symptoms and to note values of lab results. Such a flow work sheet would serve as a permanent record of the medic's performance, if this is considered necessary.

Marginal Punched Cards

A simple punched card sorting device for estimating the probability of diseases given the presenting symptom complex is discussed in detail in a 1959 paper by Ledley and Lusted (19). Perhaps a similar method could be adopted for the format of the flow

sheets. This could provide approximate current statistical estimates for each decision, before a computer is available to the medics.

INHERENT DEFICIENCIES OF A FLOW SHEET

I would like to close this discussion of the development of a flow sheet on a cautious note. There are several deficiencies inherent in the basic concept of a medical flow sheet. I would like to discuss two. (Other arguments are considered in the paper by Sterling et al., ref. 16, specifically in reference to programming computers for medical diagnosis, but they are applicable to flow sheets as well).

A Flow Sheet Must Be Incomplete

First, a flow sheet must be incomplete. Ledley and Lusted (19) estimate that about 300 diseases and 400 symptoms must be considered in the practice of any medical specialty. If all combinations of disease and symptom complexes are possible, there are 2^{700} (about 10^{200}) symptom-disease patterns. Overall and Williams comment that "it is obviously unrealistic...to attempt to determine probabilities for a system in which the number of different categories exceeds the present population of the United States by a factor of 10^{192}" (25). Although this number is an overestimate

in that many of the 2^{700} symptom-disease patterns do not occur in nature, it is an underestimate for CHM purposes in that it considers the number of diseases and symptoms in a medical specialty rather than a general medical clinic. At any rate, it becomes apparent that a flow sheet must be incomplete as to both the number of disease - symptom patterns it considers and the statistics used in determining their probability of occurrence. The lesson to be learned here is that any attempt to construct a complete flow sheet is doomed to failure and that efforts should be directed more toward constructing a useful flow sheet.

A Flow Sheet's Logic is Not Human Logic

The second inherent failing of the flow sheet concept would remain even if the virtually infinite statistical basis for decisions were available. To quote the Sterling paper: "It would appear...that diagnosis from scratch has so many features of human ingenuity and creativity that its replication by a computer program (or flow sheet) seems rather unlikely." (16) The "feeling" a doctor or medic has for a problem and his ability to "play a hunch" in a specific instance are both human attributes that cannot be transmitted by the linear logic of a flow sheet. A physician's logic may not be linear at all but more a pattern of impressions.

The experience of seeing, hearing, and touching an individual patient manufactures a gestalt for any given medical case that while it, perhaps, remains undefined to the conscious mind influences the way the physician (or medic) thinks about the problem. (See 45, 46). I can imagine that the physician who designed a flow sheet for a given symptom using generalizations from his past experience might not follow that flow sheet on the very next patient that presents that symptom, because, "for some reason" that patient was "somehow different" (as is every patient). In order to deal with this lack of "feeling" for the individual case inherent in a flow sheet, it is first necessary to remember this deficiency when designing the flow sheet. This means that the medic is not to be considered as passively following the orders given him by the flow sheet. The flow sheet's lack of sensitivity for each patient renders it incompetent to give orders. In its proper design and use, the flow sheet should provide the medical logic and the medic should provide the human sensitivity and judgment.

SUMMARY

The following is a summary of the recommendations for the development of flow sheets presented in this paper.

1. Use symptoms as starting points for flow sheets and as a means of ordering the pattern of flow.

2. Keep terms as simple as possible with minimum use of technical words.

3. Use a data base to acquire general information early.

4. Identify emergency situations early by means of a checklist of relevant signs and symptoms.

5. Rely on clinical experience rather than statistics as a basis of decisions within the flow sheet, for the time being.

6. Keep the pattern of flow logically and visually simple by:

   a. being dogmatic, if necessary, to avoid confusing details and ambiguities.

   b. choosing signs and symptoms for their ability to maximally discriminate between considered diseases.

   c. using the same design for the pattern of flow for all flow sheets.

7. Include psychiatric problems in the same flow sheets as organic disease. Identify psychiatric emergencies separately.

8. Pediatric problems should be separated from adult problems to a degree considered appropriate for the symptom heading.

9. Remember that: a) flow sheets are necessarily incomplete and b) flow sheets cannot reproduce human sensitivity, judgment and ingenuity in dealing with the individual patient. A flow sheet is most valuable if it is used as a guide for logic in thinking about a medical problem.

Examples of the problems encountered when some of these suggestions are ignored are illustrated in Appendices VIII, IX, and XII. Appendix XII comes closest to fulfilling the suggestions of this paper, although it too is still unsatisfactory for field trial. It should be noted that in discussing the flow sheets of the Tucson students and my own, I do not criticize the appropriateness of the diseases and the specific symptoms chosen to be included under each section of the flow sheets. This is because mistakes in this aspect of designing the flow sheets are attributed to the lack of clinical experience (especially among the Navajos) of the students and not to any deficiency in their logic. Hopefully, this difficulty will be resolved by having experienced phsycians determine the content of the flow sheets.

COMMENTARY

The impetus for the establishment of the Navajo Community Health Medic Program was the increasingly expressed desire among Navajos that their health needs be supplied by their own people. Medicine men had traditionally served as healers for the Navajo people. However, in more recent times as the more acculturated Navajoshave become more medically sophisticated, they have turned to the Public Health Service to provide their health care. This has probably helped decrease the morbidity and mortality rates of some diseases (50), but it has damaged the Navajo peoples sense of self-reliance and cultural pride. Impersonal treatment at PHS facilities, although perhaps unavoidable in this system of health care delivery, has served to increase the Navajos' resentment and distrust of PHS physicians, and anglos in general (51).

The establishment of a corps of Indian physician assistants should help restore some of the Navajos sense of self-reliance and cultural pride as well as increase the number of medical practicioners on the reservation. Of equal importance it should provide more personalized delivery of Western methods of health care, tailored specifically to the needs of the Navajo people and the individual. This is turn should ultimately result in better health care (52).

The medic aspiring to achieve these goals should be sensitive to the Navajo culture; and more specifically, the influence of the culture on the manifestation of disease in the Navajo people. The reasons why cultural sensitivity is such a fundamental prerequisite to the medics success as clinicians will be the main consideration of this section. First, however, it may be useful to identify the levels of acculturation present on both sides of the medic-patient relationship. This will give us a basis on which to build later arguments.

I stated earlier in this paper that candidates for the Navajo CHM program were generally less acculturated than their Tucson counterparts. However this difference is only relative. It was considered desirable by both programs that candidates have some level of training as health workers on which to build their training as medics. All candidates therefore had experienced a considerable amount of acculturating influences in their elementary and secondary school education, and later in nursing or technical school or in the army. Somewhere along the line, they had been instilled with a drive for upward mobility and the desire for economic security, social standing, and a position of responsibility that upward mobility implies. We might assume that the relatively prestigious and renumerative position of community health medic will serve to

satisfy this drive. This suggests that CHM trainees are among the more acculturated Indians. More relevant to their role as health care provider to the Navajo people, they have embraced Western medicine with its biological foundations to a greater extent than the average educated Navajo. Acculturation, while necessary for the job, does create some problems. For example, one of the more concrete signs of their level of acculturation is already becoming apparent in the aversion of many of the trainees to assignments in the more remote areas of the reservation where they are most needed.

We should also consider the levels of acculturation that exist among the Navajo people, for this determines to a great extent the type of medical care they seek. Generally the least acculturated people are the oldest (over 40 years) and live in the most isolated regions of the reservation. They have probably lived on the reservation their entire lives. They probably have not had any formal education and they speak Navajo almost exclusively. They lead much the same life as their ancestors. They belive that sickness is the results of a transgression against nature or the maleficence of a witch. Accordingly they would seek a medicine man to remove the curse. It should be noted that not even this group is completely unacculturated. They may drive pick-up trucks and make trips to border towns (and thus be exposed to some of the

"illnesses of civilization" such as alchoholism, venereal disease, and tuberculosis). They are also visit ed by their more acculturated relatives. For example a grandparent may even visit a PHS clinic on the advice of his progency.

A middle group of acculturation has less defined age limits, perhaps from the twenties to the forties. They may live on the reservation or in border towns; perhaps they may have homes in both places. They may have an elementary education (possibly also a secondary education) at church or public schools. They speak both English and Navajo (although they prefer the latter). They know the traditional Navajo ways and keep them to a varying extent. They may be ambivalent towards Western medicine and medicine men alike. Accordingly they might go to the anglo doctor for symptomatic relief but seek the medicine man to remove the source of ill health.

The most acculturated Navajos are the youngest, ranging in age up the mid-twenties. These people have gone to anglo schools most of their lives. They speak English, perhaps exclusively and they have a rather sketchy understanding of the Navajo ways. They are becoming socially and politically active in working to preserve the Navajo culture, although they are trying to reject their parents' superstitions concerning witchcraft. Therefore younger people tend to visit only anglo doctors when they are sick.

While innumerable shades of acculturations have been rather arbitrarily grouped in the above three categories, it becomes obvious that the relationship of the medic to the patient depends on the level of acculturation of both parties. The least acculturated Navajos probably would not seek a medic's aid. Although the medic will be an Indian, perhaps even a Navajo, he will be thought of as a representative of anglo technology, which is not highly esteemed among the traditional Navajos. They will probably consider the medic too young to be wise, and too acculturated to understand the ways of the older population.

The CHM program is perhaps most suited to the moderately acculturated category of Navajo. In addition, if the trend towards a greater cultural identity continues among young Navajos, this most acculturated group may be attracted to health care provided by the Navajo medic. Indeed this group probably will be the source of future medics. I will therefore consider the health expectations of these latter two groups of prospective patients in greater detail.

The main argument of this discussion will be that if the culture of a people influences the expression of illness in members of that culture, it would be wise for the medic to be sensitive to this relationship and consider each patient's problem from a cultural

as well as a biological perspective in order to determine the correct disposition for each patient.

It is possible that the same disruption in the physiological or biochemical hemeostasis of a person of one culture is made manifest in different symptoms (perhaps even signs) than in a person of another culture. This variability is seen to some extent in persons of the same culture; it seems possible that culture may influence the expression of disease even further. To borrow the terms of the flow sheet designer, the components of a symptom complex may vary according to the culture being considered. For example, the diagnostic term "perforated ulcer" implies the symptom comples of hematemisis, melena, tender ridgid abdomen, and severe abdominal pain. However, this classical pattern applies only to the most often described (i.e. Caucasian) population. Perhaps Navajos do not complain of abdominal pain. Maybe they are more stoic or have a higher threshold to pain. Perhaps in another tribe it is more socially acceptable for a member to complain of headache when he has belly pain. The point is that abdominal pain may not be necessary criteria for arriving at the proper disposition of a Navajo patient.

Learned symptom patterns should be tailored to the culture rather than the textbook. Perhaps a medicine man or the medics

themselves should assist a PHS physician in matching symptoms with disease entities, as a basis for the design of flow sheets. One aspect of the teaching of medics should be to make them aware of any symptomatic peculiarities of their patients.

The above argument may also hold, to a lesser degree, for signs; i.e. perhaps physical signs are influenced by cultural or genetic differences among races. For example, if a Navajo man having an acute coronary occlusion does not have a very rapid pulse rate, it may be because coronary artery disease is so rare among his people (Gilbert J: Absence of coronary thrombosis in Navajo Indians. Calif. Med. 82: 2, 114) among his people that he has less anxiety that his chest pain indicates a heart attack. Alternatively his autonomic nervous system may react differently to decreased cardiac output. Admittedly this is more speculative than the discussion of symptoms, but the point remains valid that medics should be sensitive to "unusual" presenting features of illness among his Navajo patients.

An anecdote might help fix this concept in the reader's memory. A 20 year old Navajo male seen in the night emergency clinic of a bordertown PHS hospital complained that a spider had urinated on his abdomen. "How do you know?" asked the student. "I know," said the young man. "Did you see or feel the spider?" "No."

The student could not find the site of insult on the abdomen. Frustrated, he called the General Medical Officer on duty who asked a few more inclusive questions. He finally elicited a history of very recent sexual contact and fear of having contracted veneral disease. There were no contributory signs or symptoms. The patient was then reprimanded for coming to the night clinic for a non-emergent problem and told that if he wished further attention he should return to the clinic in the morning.

There are two morals to this story. The first advises the medic to learn the symptom equivalents peculiar to the Navajo people (e.g. a history of being urinated upon by a spider = fear of venereal disease). The second moral concerns the disposition of Navajo patients--a subject I will now discuss in detail, for it is another way that culture impinges upon the delivery of health care.

The disposition chosen by the GMO in the above story was not ideal for several reasons. The patient was very anxious. He had driven 40 miles on unpaved roads at night from a desolate part of the reservation to seek the aid of western medicine, only to be rejected by it. The medic must consider all extenuations in deciding upon the disposition of his patients.

Patients must often travel great distances to reach clinics, often at great expense. (A mother might have to give a neighbor a couple of sheep to drive her sick child to clinic in his truck). This behooves the medic to treat his patient even if he is inconvenienced himself.

In some cases the practical treatment may not be the one described as ideal in textbooks. For example, the use of placebos in functional complaints should be considered serious medical practice among the Navajos. White man's drugs still carry a magical connotation even among more acculturated Navajos. Often a patient will not feel he has been adequately treated unless he receives an injection (even if it is only parenteral saline). I do not mean to imply here that placebo treatment should replace attempts to seek and discuss the psychosocial basis for a functional complaint, I am suggesting only that the placebo effect of white man's medicine might be considered a potent supplementary treatment when dealing with Navajos once organic etiologies are ruled out.

The cultural stigmata of a disease must also be considered in dealing with Navajos. For example, the awkward gait ensuing from an untreated congenital hip does not bear any social stigmata among older Navajos as it would within anglo culture. This is not to suggest that congenital hip should be left untreated when diagnosed

by the medic. However, this may explain why a Navajo parent might not seek medical attention for an afflicted child.

Westerners like to speculate that medicine men work their healing arts through powerful interpersonal skills and intuitive understanding of illness behavior and its relationship to body functions. If this is true, the medic would do well to learn from the medicine man and take a holistic approach in dealing with his patients. I am suggesting that medics blend the arts of both the medicine man and the anglo doctor. He will replace neither but he should supplement both. If successful he will serve as a bridge between the two. The sharing of ideas and experiences would ultimately benefit the patient.

For example, often an acculturated patient feels guilty or embarassed to admit that he also consults a medicine man. A medic who shows an earnest effort to understand the patients situation could refer him to the proper medicine man if he considers it a proper disposition. He would thus assuage the patients guilt and make a friend of the medicine man. If the medic feels that a medicine man would be less helpful than western medicine in a particular problem he could more easily gain the patients confidence by empathizing with his beliefs. A medic who displays such understanding could more likely pursuade a hesitant patient to

visit a PHS clinic rather than fruitlessly spending a great deal of money for the services of a medicine man. There is in Navajo way a profession known as hand-tremblers. These practicioners determine the source of a person's ailment and then recommend the proper medicine man who specializes in dealing with that particular cause. The Navajo medic could fit nicely into this scheme if he were considered by his patients a versatile type of hand-trembler, who could treat and refer patients to anglo physicians as well as to medicine men.

Health and religion are intimately linked in the Navajo way. It might be possible for those who are bringing western medicine to the Navajo to learn from the mistakes of those who brought western religion. The churchmen represented christianity as the one true religion. They forced their teachings on the Navajo with the good intention of saving infidels from eternal damnation. However, Navajos accept new ideas slowly, only after they have proven useful. This is true whether it is a new way of saving their souls or new way of saving their lives. Therefore medics would be wise not to prosletize for western medicine with the same zeal as missionaries who forced the gospel upon their ancestors, or they will attain only their same limited success. They should rather work with their people, within their common culture as a compassionate guide and fellow traveler, through the changes that the culture will inevitably experience, toward the goal of better health care for the Navajo people.

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TWENTY MAJOR HEALTH PROBLEMS ON THE PAPAGO INDIAN RESERVATION BASED ON NUMBER OF VISITS (4)

1. Acute Upper Respiratory Disease and Bronchitis
2. Diabetes Mellitus
3. Injuries and Accidents
4. Skin and Subcutaneous Disease
5. Obesity, non-endocrine
6. Flu, Pneumonia, and Bronchopneumonia
7. Circulatory Diseases
8. Diseases of the Eye
9. Intestinal Infectious Diseases
10. Diseases of the Ear and Mastoid
11. Arthritis and Rheumatism
12. Genitourinary Disease
13. Viral Diseases
14. Mental Disorders
15. Other Bacterial Diseases, including Strep.
16. Appendicitis, Obstructive Hernia
17. Mycoses
18. Venereal Disease
19. Biliary Disease
20. Tuberculosis

HEALTH PROBLEMS ACCOUNTING FOR MORE THAN 1000 VISITS TO OUTPATIENT CLINICS IN THE NAVAJO AREA FROM JULY 1, 1970, TO MARCH 1971

NO.	DISEASE	DX CODE	TOTAL VISITS
1.	URI	300	20,657
2.	Health Surveillance	820	9,374
3.	Innoculation and/or Vaccination	825	7,748
4.	Acute Otitis Media	250	6,958
5.	Paryngitis and Tonsillitis (nonstrep)	301	4,465
6.	Prenatal Care	480	3,897
7.	Strep Throat	010	3,850
8.	Pneumonia	312	3,709
9.	Flu Syndrome	305	3,680
10.	Bronchitis and Bronchiolitis	310	3,340
11.	Other Musculoskeletal Disorders	570	3,338
12.	Other Diseases of Skin	520	2,669
13.	Laceration Op/Wound	730	2,604
14.	Chronic Otitis Media	251	2,288
15.	Infectious Eye Dis. (Bact)	214	1,838
16.	Other Diarrheal Disease	013	1,816
17.	Other Eye Disease	216	1,783
18.	Urinary Tract Infection	400	1,758
19.	Impetigo	500	1,689
20.	Superficial Contusion	731	1,642
21.	Eczema and Skin Allergy	510	1,564
22.	TB Converter or INH Prophyllaxis	010	1,529
23.	Disloc., Sprain, Strain	702	1,495
24.	Gastritis, Non Spec.	350	1,323
25.	Fx of Extremity	701	1,301
26.	Infected Wound	502	1,275
27.	Other Ear Diseases	256	1,251
28.	Other Inflam. of Eye	215	1,219
29.	Other Symp. Ill-Def. Cond.	805	1,219
30.	Refract. Errors	210	1,213
31.	Other Bact. Infect. of Skin	501	1,140
32.	Diabetes Mellitus	080	1,134

SERVICE UNIT RANKING

Area Ranking	DISEASE	Chinle	Crownpoint	Fort Defiance	Gallup	Kayenta	Project Hope	Shiprock	Tuba City	Winslow
1	URI	1a	1a	1a	1a	1a	1a	1a	1a	1a
2	Health Surveillance	2a	2a	2a	2a	4b	2a	2a	5b	3b
3	Innoc. and/or Vaccination	5b	3a	*	3a	5b	5b	3a	2b	
4	Acute Otitis media	4a	4a	3b	6b	2b	4a	5b	3b	4a
5	Pharyngitis and Tonsillitis (ns)	3b	8b	5a	11c	8b	3b	6b	*	10c
6	Prenatal Care	8b	12c	7b	7b	*	7b	4b	9b	8b
7	Strep Throat	12c	6b	9b	9b	12c	13c	7a	11c	6b
8	Pneumonia	*	5b	11b	8a	3c	16c	10b	7b	5b
9	Flu Syndrome	6b	*	6b	13c	6b	9a	*	4c	7b
10	Bronchitis and Bronchiolitis	9b	*	4c	10a	7b	6c	*	8b	12b
11	Other Musculo-skeletal disorders	5c	11a	13b	5c	*	10b	9b	10b	15c
12	Other disease of skin	11b	*	10b	9b	10b	12a	12a	14b	11b
13	Laceration op/wound	14b	13a	8c	14b	14b	8c	8c	*	16b
14	Chronic Otitis media	15b	9c	*	19c	9c	*	19c	6c	13b
15	Infectious eye disease (bact.)	16b	15a	*	20c	13b	*	*	15a	17b
16	Other diarrheal disease		10c	15b	16a		11c	14b	20c	22c
17	Other eye diseases			16b	12c		*	22c	16b	20b
18	Urinary tract infection			12c	17b		14c	20b	19b	*
19	Impetigo				21b			11c	17b	*
20	Superficial confusion			13c			15c	17b	*	18b
21	Eczema and skin allergy						18b	*	18b	19b
22	TB converter or INH prophyllaxis		7d					13c	13c	*
23	Disloc., spr., strain			14d						*
24	Gastritis, non spec.	7d								*
25	Fx of extremity				15d					
26	Infected wound		14d							
27	Other ear diseases									23b
28	Other inflam. of eye					15d				14d
29	Other symps. and ill def. cond.	13d						16d		9d
30	Refract. error				18d				12d	21d
31	Other bact. infect. of skin					11d				
32	Diabetes Mellitus							18d		

a = Same rank in Service Unit as Area
b = Within 3 ranks in Service Unit order as Area
c = Not within 3 ranks in Service Unit order as Area
d = Rank very different in Service Unit order and Area
* = Not among diseases ranked high enough to be considered for Service Unit

CHART LINKING DISEASES AND SYMPTOMS

Rank of Dx in Area	DISEASE / SYMPTOM	Amenorrhea	Bloating	Blurred Vision	Chills	Coma	Coryza	Cough	Cramps	Cyanosis	Dehydration	Diarrhea	Discharge	Discoloration	Dysphagia	Dyspnea	Dysuria (& hemati)	Faintness	Fatigue	Feverish	Foul Odor	Frequency	Headache	Heartburn	Itching (& burning)	Lymphadenopathy	Myalgia (& arthritis)	Nausea a/o vomiting	Obesity	Pain	Paresthesia	Rash	Sore (dry) throat	Splinting	Sputum	Swelling	Unruly
	Number of Dx with this symptom	1	2	1	2	3	2	3	2	1	1	3	4	3	1	2	1	1	1	12	3	2	5	1	4	3	3	4	1	6	1	2	3	2	2	5	1
1	URI						X													X			X				X										
2	Acute Otitis Media						X					X	X							X										X			X				
3	Pharyngitis & tonsillitis (ns)														X					X						X							X				
4	Strepthroat																			X	X					X	X						X				
5	Pneumonia							X												X										X				X			
6	Flu Syndrome											X								X			X				X										
7	Bronchitis							X												X														X			
8	Bronchiolitis (peds)							X		X						X																					
9	Infectious eye disease												X												X					X					X		
10	Urinary tract infection				X												X			X		X														
11	Impetigo																								X						X						
12	Eczema & Skin Allergy																								X						X						
13	Fx of extremity (Disl. Str. &Spr.													X																				X		X	
14	Gastritis		X																					X				X									
15	Infected Wound													X							X					X				X					X		
16.	Refractive Error			X									X										X														
17	Diabetes Mellitus																					X							X		X						
18	Pregnancy	X																									X								X		
19	Vaginitis												X								X				X												
20	Cellulitis (mastitis)													X																X					X		
21	Cholecystitis		X																	X							X			X							
22	Anemia															X		X	X																		
23	Dysentary				X				X		X	X								X																	
24	Meningitis					X														X			X										X				
25	Intoxication (& poisoning)					X			X														X				X									X	
	Number of Dx with this symptom	1	2	1	2	2	2	3	2	1	1	3	4	3	1	2	1	1	1	12	3	2	5	1	4	3	3	4	1	6	1	2	3	2	2	5	1

CHART LINKING DISEASES AND SYMPTOMS

PROPOSED CHM CLINICAL PROCEDURE (4)

1. Obtain identification information.

2. Elicit chief complaint by utilizing check-list of entering symptoms. If there is no pertinent flow chart, consult physician. If an emergency situation is indicated at this point, proceed directly to step 8; otherwise, proceed to step 3.

3. Obtain history of present illness by utilizing the cover sheet of the appropriate flow chart(s).

4. Obtain past history by utilizing the corresponding checklist.

5. Obtain family history by utilizing the corresponding checklist.

6. Review symptoms by systems by utilizing the corresponding checklist.

7. Do physical examination by utilizing the general exam checklist and the cover sheet of the appropriate flow chart.

8. Follow the appropriate flow chart (and do necessary laboratory tests by utilizing the cover sheet.)

9. Prepare problem list.

10. Order laboratory tests, refer, consult, release, treat, and/or followup, as indicated.

DIARRHEA OR CONSTIPATION (4)

HISTORY

Yes	No	
___	___	Is there abdominal pain?
___	___	Is there blood in the stool?
___	___	Infant or child cries without tears, has persistent vomiting or depressed fontanelle while sitting?
___	___	Sunken eyeballs or delay in capillary return greater than 4 sec.
___	___	Patient seems lethargic or toxic?
___	___	Is duration greater than one week?
___	___	Patient has high fever, blood in stools, or green stools?
___	___	Is Duration greater than three days.
___	___	Is it a recurrent problem?
___	___	Has the patient seen a doctor about it before?
___	___	Has patient been on broad-spectrum antibiotics or laxatives?
___	___	Does patient have prominent lower belly with depression of epigastrium, and abdominal throbbing?
___	___	History of former peritonitis or operation on abdomen or pelvis?
___	___	Is duration greater than two weeks?

PHYSICAL EXAMINATION:

Yes	No	
___	___	Do careful inspection and palpation of the rectum and proctoscopic exam. Normal_____ Abnormal_____
___	___	Hard fecal mass palpable and absence of normal pitting on pressure?
___	___	Visible peristalsis and tarry stools abnormally formed, tympanites or mucus or mucus or mucopurulent blood-tinged discharge?

NAUSEA AND/OR VOMITING (4)

HISTORY:

Yes	No	
___	___	Is there abdominal pain?
___	___	Is there edema or dyspnea?
___	___	Is there sore throat present?
___	___	Are there urinary symptoms?
___	___	Is there vertigo?
___	___	Is headache a prominent symptom?
___	___	Is there a history of recent head trauma?
___	___	Is vomiting brought on by coughing?
___	___	Enlarged thyroid (bilateral) present, exopthalmos?
___	___	History or recent ethanol or drug (i.e. Digitalis) or chemical ingestion?
___	___	Is patient intoxicated with ethanol?
___	___	Is patient jaundiced?
___	___	Is patient a known diabetic and/or has acetone breath and/or in coma with acetone odor of breath?
___	___	Is nausea associated with any kind of travel?
___	___	Is patient pregnant?
___	___	Did some extreme shock or fright precipitate nausea and/or vomiting?
___	___	Has patient undergone recent general anesthesia or radiation therapy?
___	___	Immediate regurgitation after eating?
___	___	Is patient an infant?
___	___	Persistent vomiting, wasting, possibly a palpable mass in right epigastrium?
___	___	Is patient a woman of childbearing age?
___	___	Is patient pregnant and/or has amenorrhea, frequency of urine and/or enlargement or tenderness of breasts?
___	___	Has pregnancy previously been confirmed by a physician?
___	___	Insomia, nervousness and/or loss of daily food intake, dehydration, weight loss, extreme thirst, coma, convulsions, edema, or increased blood pressure?

PHYSICAL EXAMINATION:

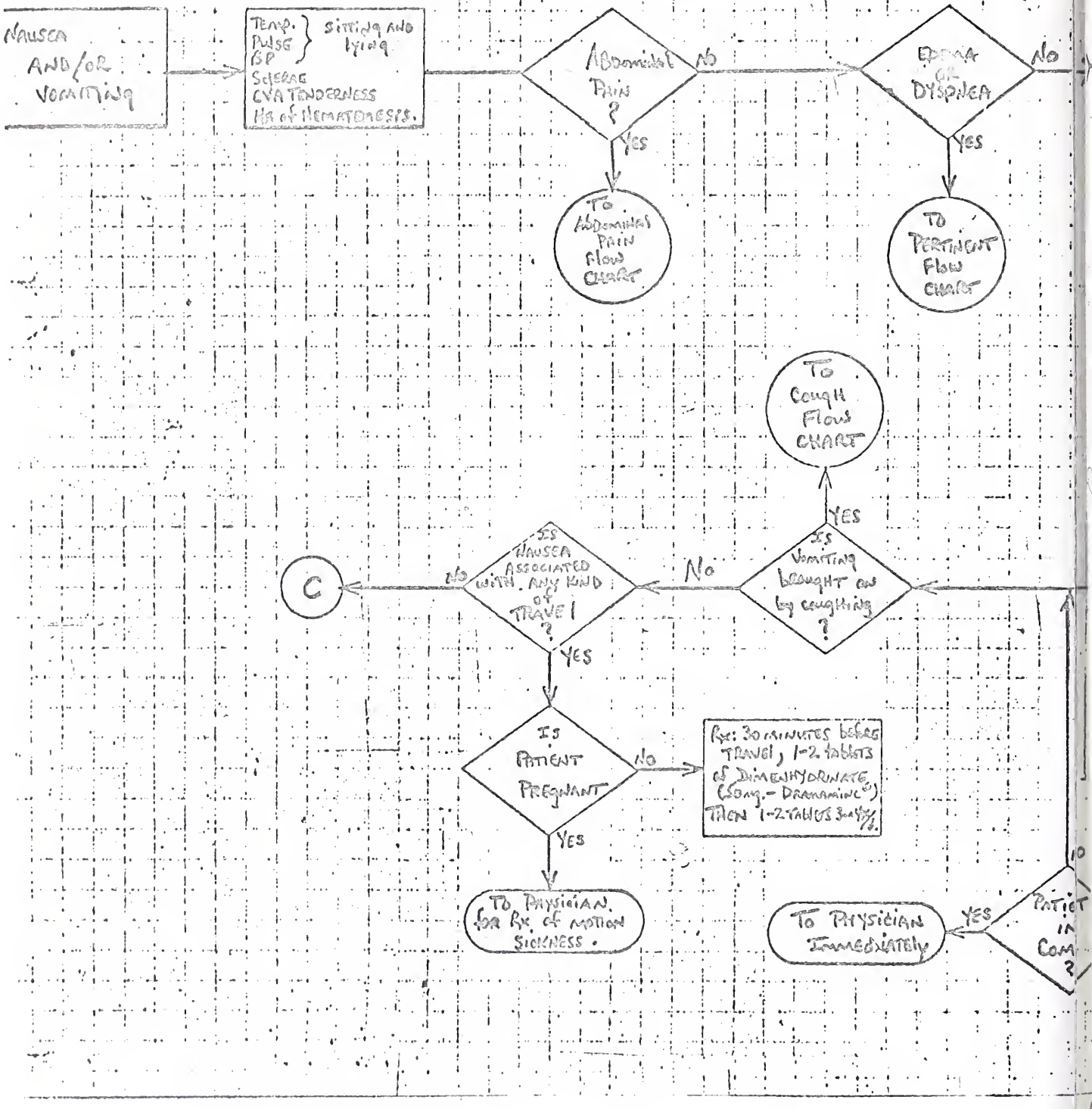
___	___	Do Pelvic Exam

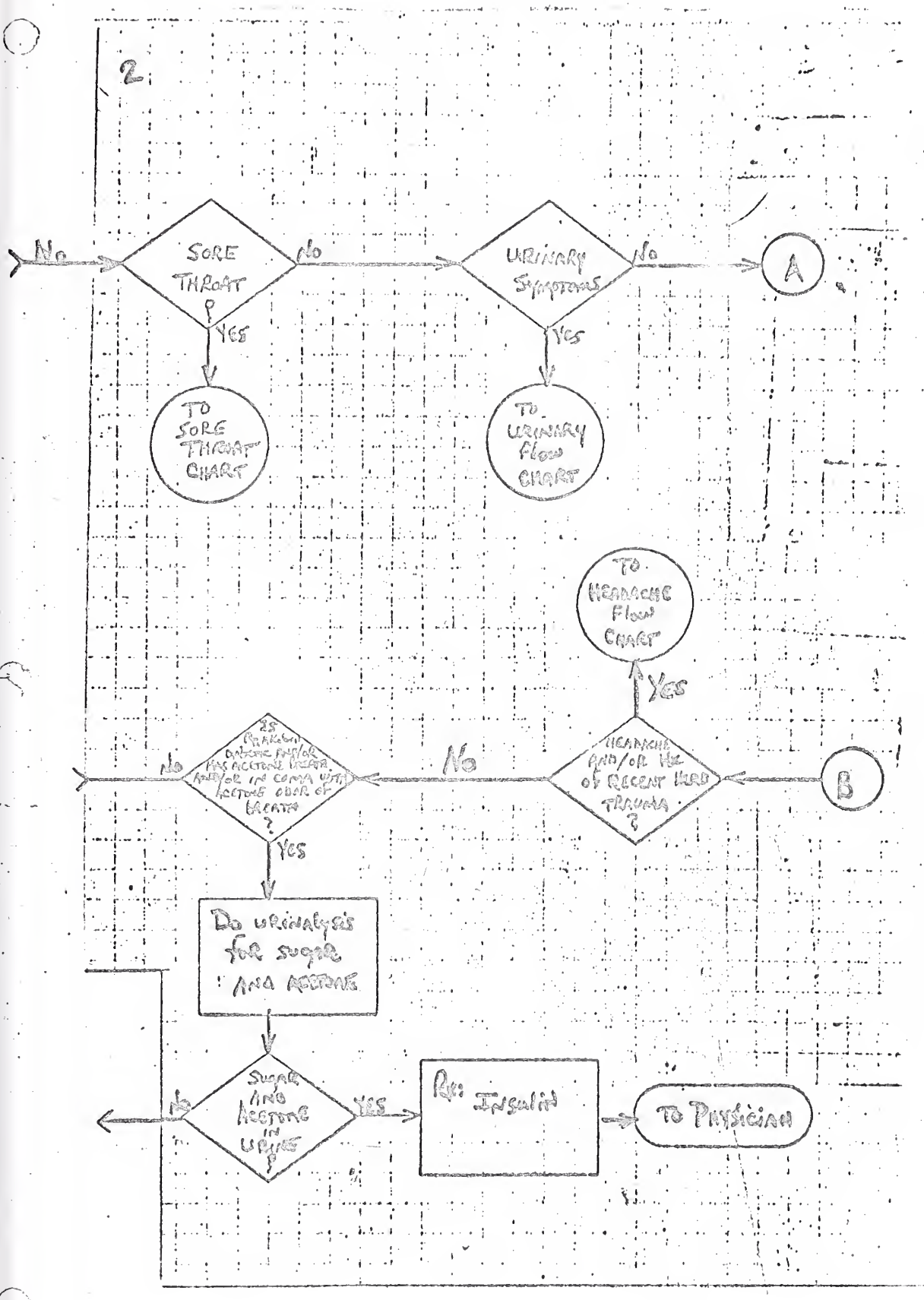
LABORATORY TESTS:

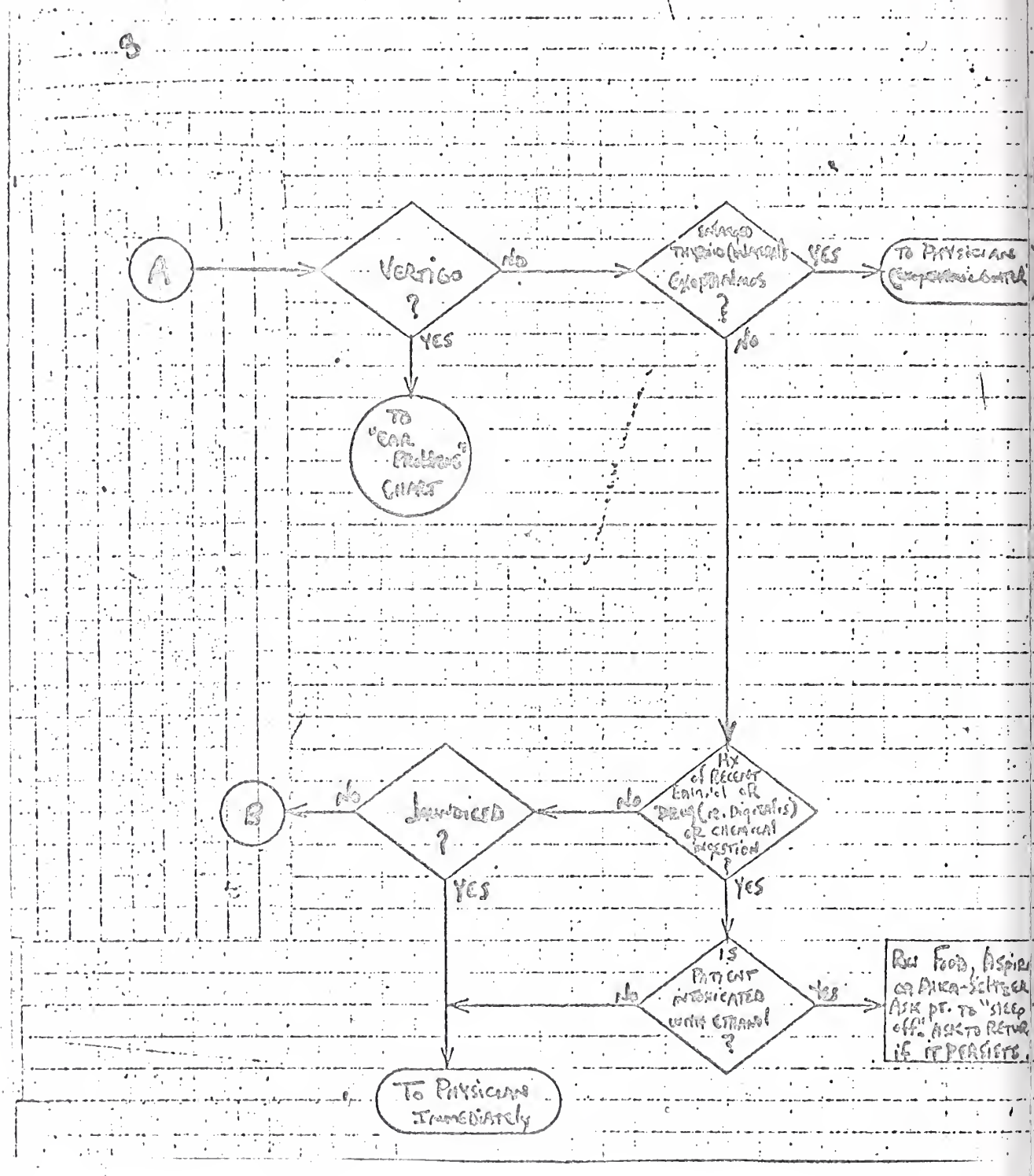
Pregnancy test: Positive_____ Negative_____

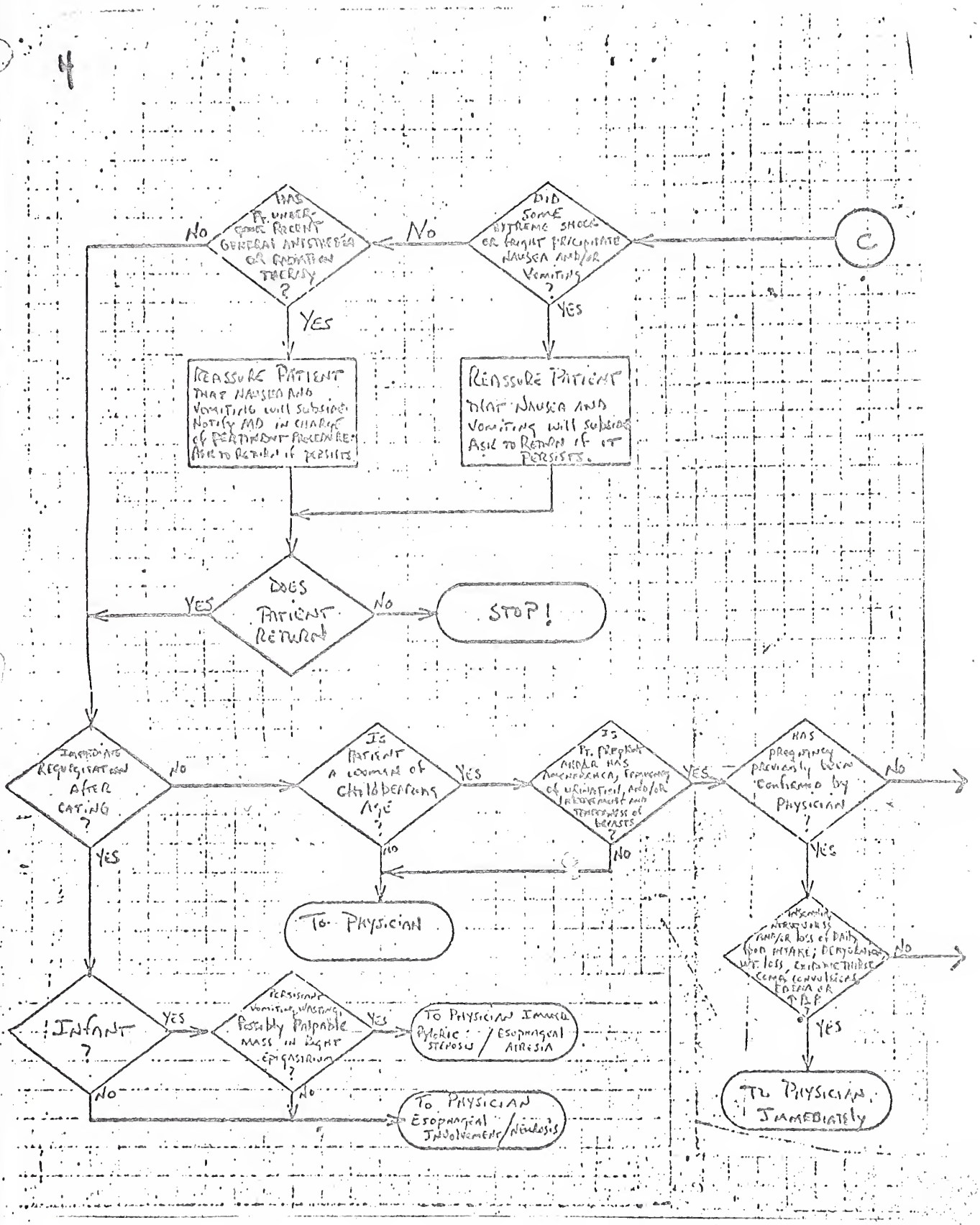
Urinalysis for sugar and acetone: Positive_____ Negative_____

Appendix VIII

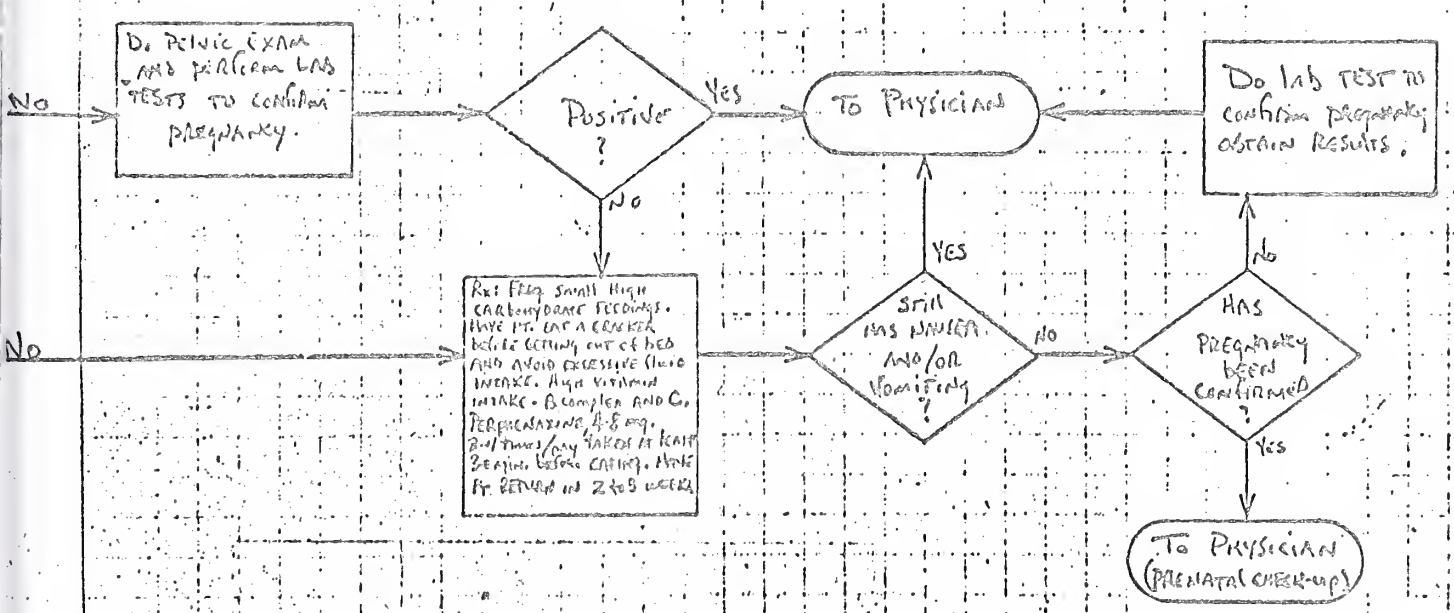



2
No
SORE THROAT ?
No
YES
TO SORE THROAT CHART
URINARY SYMPTOMS
No
YES
TO URINARY FLOW CHART
A
TO HEADACHE FLOW CHART
YES
HEADACHE AND/OR HX OF RECENT HEAD TRAUMA ?
No
B
IS RAKOON DIABETIC AND/OR HAS ACETONE BREATH AND/OR IN COMA WITH ACETONE ODOR OF BREATH ?
No
YES
Do urinalysis for sugar and acetone
SUGAR AND ACETONE IN URINE ?
No
YES
Rx: Insulin
TO PHYSICIAN

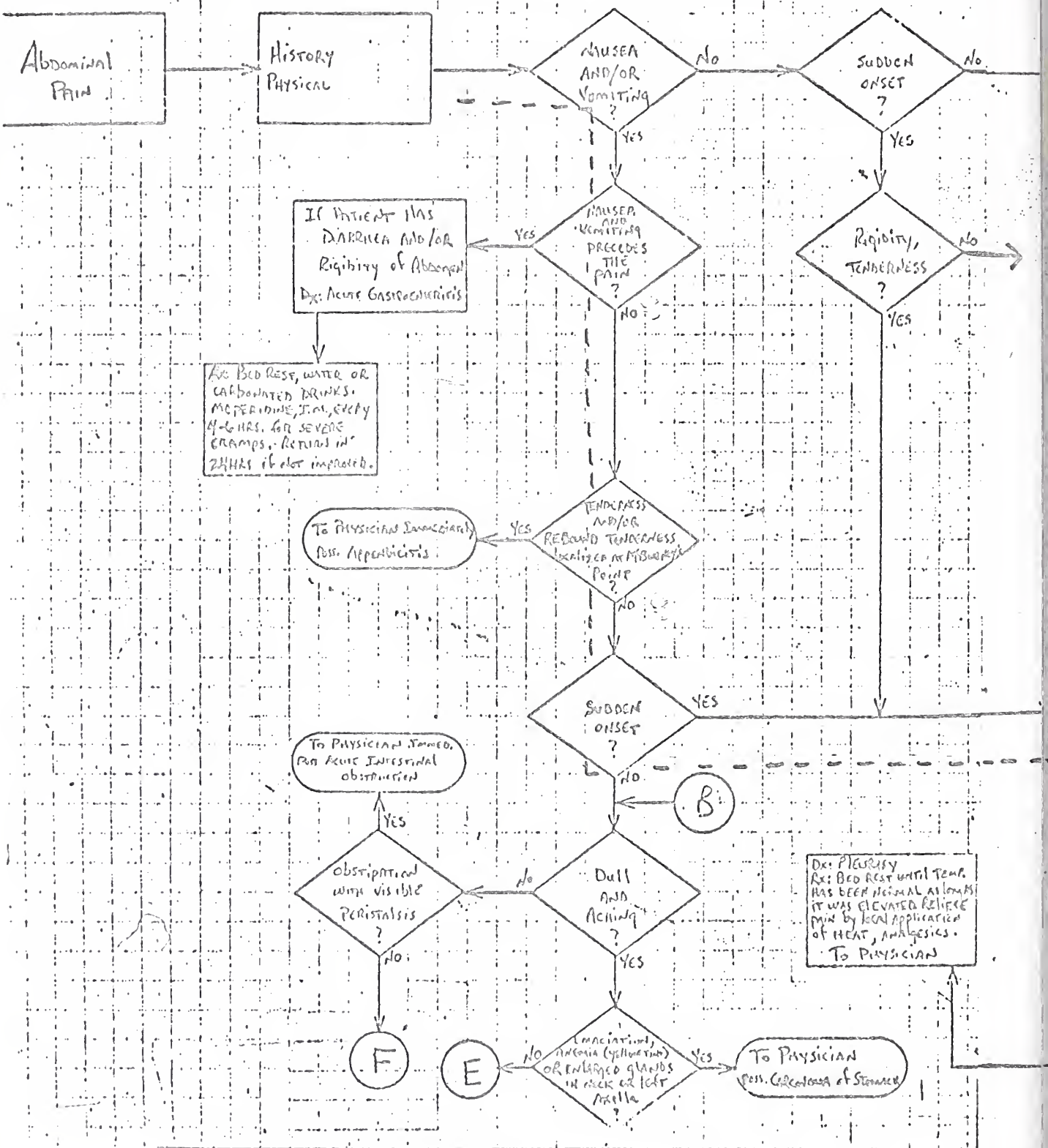

A
VERTIGO ?
no
YES
ENLARGED THYROID (NECK) EXOPHTHALMOS ?
YES
TO PHYSICIAN (OPHTHALMOLOGIST)
No
TO "EAR PROBLEMS" CHART
Hx of RECENT TAKING OF DRUG (e.g. Digitalis) OR CHEMICAL INGESTION ?
YES
IS PATIENT INTOXICATED WITH ETHANOL ?
YES
GIVE FOOD, ASPIRIN OR ALKA-SELTZER. ASK PT. TO "SLEEP OFF". ASK TO RETURN IF IT PERSISTS.
no
JAUNDICED ?
YES
no
B
To PHYSICIAN IMMEDIATELY


4
C
DID SOME EXTREME SHOCK OR FRIGHT PRECIPITATE NAUSEA AND/OR VOMITING ?
NO
YES
HAS PT. UNDERGONE RECENT GENERAL ANESTHESIA OR RADIATION THERAPY ?
NO
YES
REASSURE PATIENT THAT NAUSEA AND VOMITING WILL SUBSIDE. NOTIFY MD IN CHARGE OF PERTINENT PROCEDURE. ASK TO RETURN IF PERSISTS
REASSURE PATIENT THAT NAUSEA AND VOMITING WILL SUBSIDE ASK TO RETURN IF IT PERSISTS.
DOES PATIENT RETURN
YES
NO
STOP!
IMMEDIATE REGURGITATION AFTER EATING ?
NO
YES
IS PATIENT A WOMAN OF CHILDBEARING AGE ?
YES
NO
IS PT. PREGNANT AND/OR HAS AMENORRHEA, FREQUENCY OF URINATION, AND/OR INTERMITTENT AND TENDERNESS OF BREASTS ?
YES
NO
HAS PREGNANCY PREVIOUSLY BEEN CONFIRMED BY PHYSICIAN ?
NO
YES
TO PHYSICIAN
INSOMNIA, NERVOUSNESS AND/OR LOSS OF DAILY FOOD INTAKE; DEHYDRATION, WT. LOSS, EXTREME THIRST, COMA, CONVULSIONS, EDEMA OR ↑BP ?
NO
YES
TO PHYSICIAN IMMEDIATELY
INFANT ?
YES
NO
PERSISTANT VOMITING, WASTING, POSSIBLY PALPABLE MASS IN RIGHT EPIGASTRIUM ?
YES
NO
TO PHYSICIAN IMMED. PYLORIC STENOSIS / ESOPHAGEAL ATRESIA
TO PHYSICIAN ESOPHAGEAL INVOLVEMENT / NEUROSIS

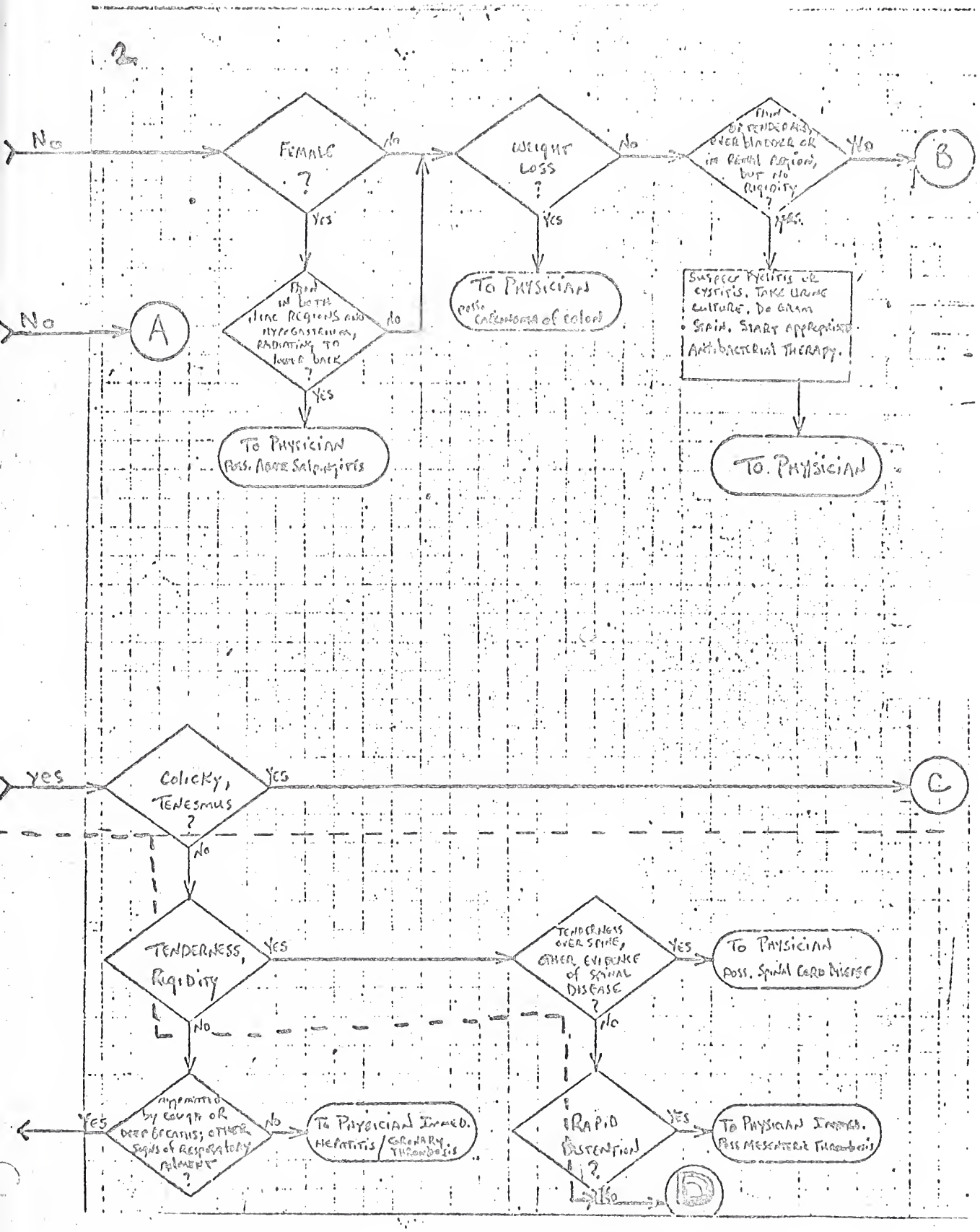
5

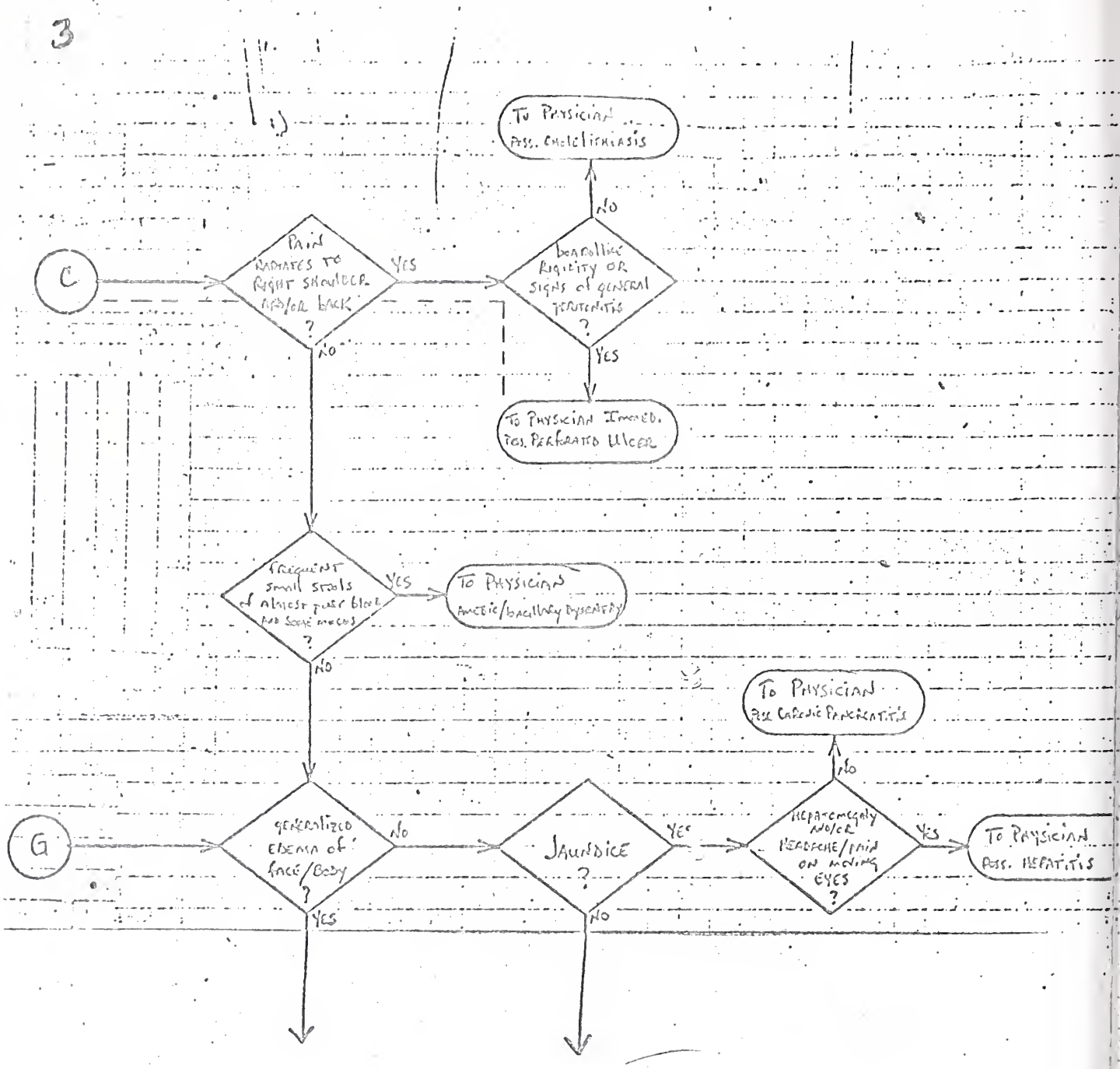

No
Do Pelvic Exam and perform lab tests to confirm pregnancy.
Positive ?
Yes
No
To Physician
Do lab test to confirm pregnancy obtain results.
No
Rx: Freq small high carbohydrate feedings. Have pt. eat a cracker before getting out of bed and avoid excessive fluid intake. High vitamin intake. B complex and C. Perphenazine, 4-8 mg. 3-4 times/day taken at least 3 mg. before eating. Have pt. return in 2 to 3 weeks
Still has nausea and/or vomiting ?
Yes
No
Has pregnancy been confirmed ?
No
Yes
To Physician (prenatal check-up)

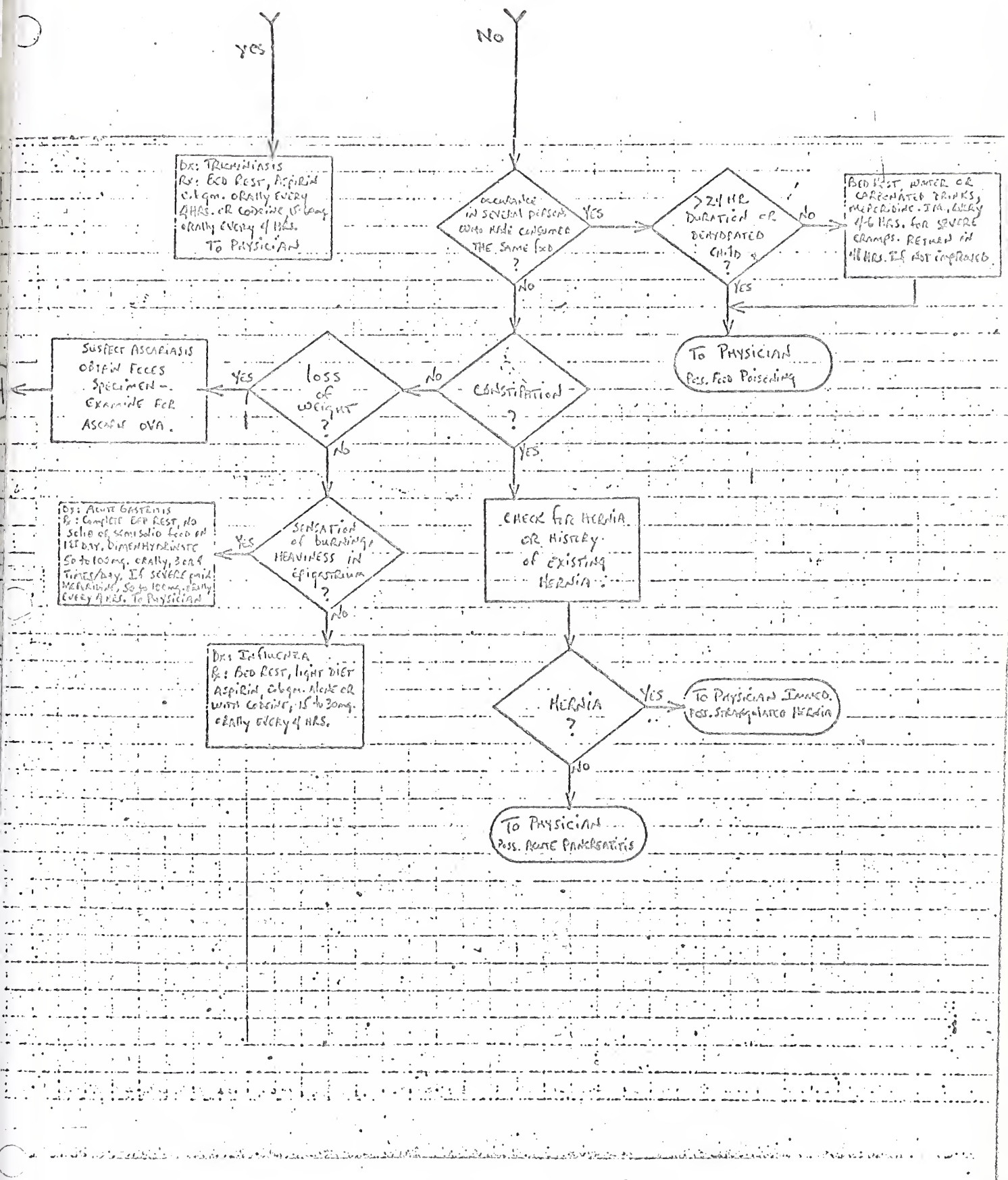
APPENDIX IX



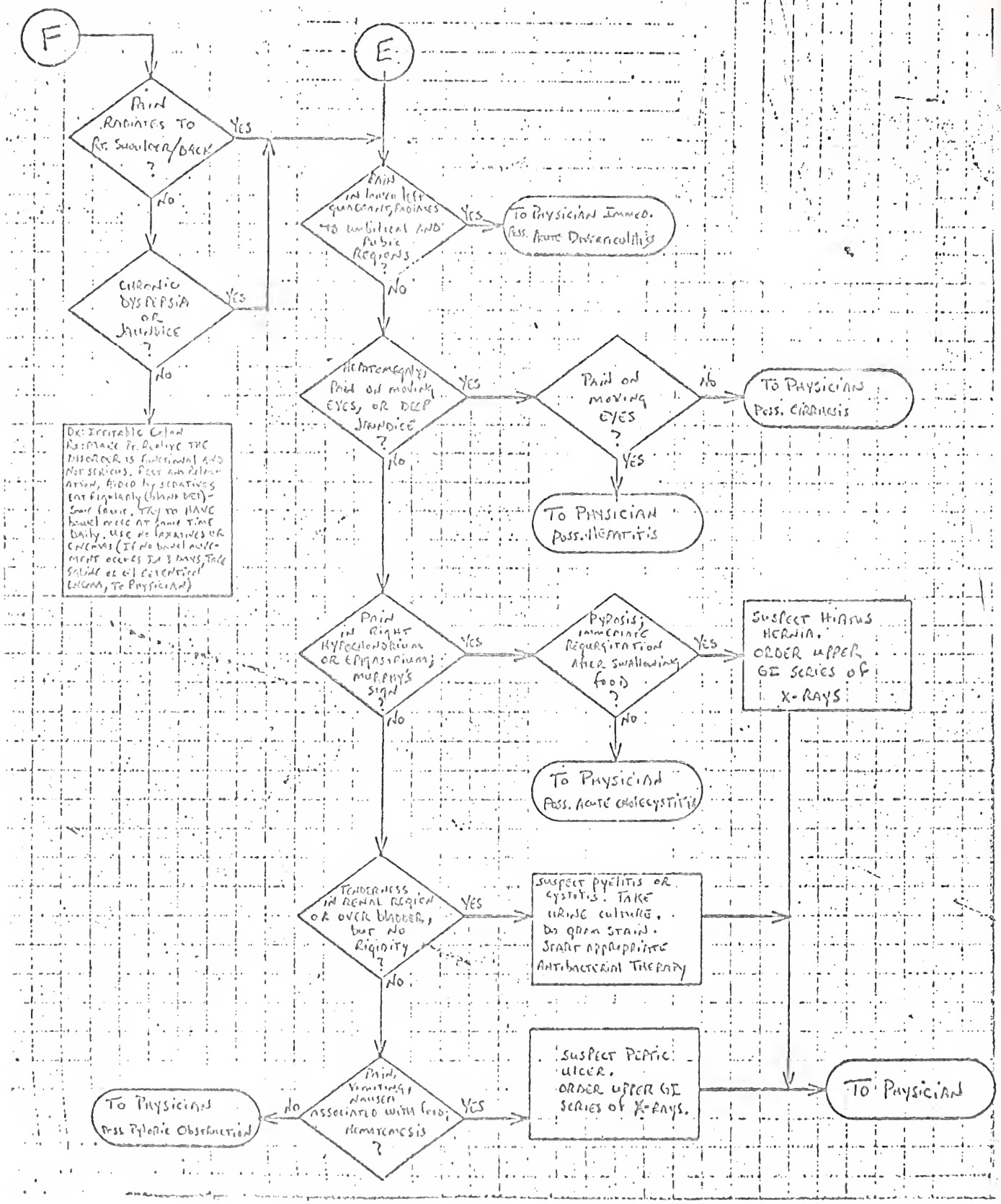
Abdominal Pain
History Physical
Nausea and/or Vomiting ?
No
Yes
Sudden Onset ?
No
Yes
Nausea and Vomiting Precedes the Pain ?
Yes
No
If Patient Has Diarrhea and/or Rigidity of Abdomen Dx: Acute Gastroenteritis
Rx: Bed Rest, water or carbonated drinks. Meperidine, I.M., every 4-6 hrs. for severe cramps. Return in 24 hrs if not improved.
Rigidity, Tenderness ?
No
Yes
Tenderness and/or Rebound Tenderness localized at McBurney's Point ?
Yes
No
To Physician Immediately Poss. Appendicitis
Sudden Onset ?
Yes
No
B
Dull and Aching ?
No
Yes
Obstipation with visible Peristalsis ?
Yes
No
To Physician Immed. Poss Acute Intestinal obstruction
F
Emaciation, Anemia (yellowing) or enlarged glands in neck or left Axilla ?
No
Yes
E
To Physician Poss. Carcinoma of Stomach
Dx: Pleurisy
Rx: Bed Rest until Temp. has been normal as long as it was elevated. Relieve pain by local application of heat, analgesics.
To Physician

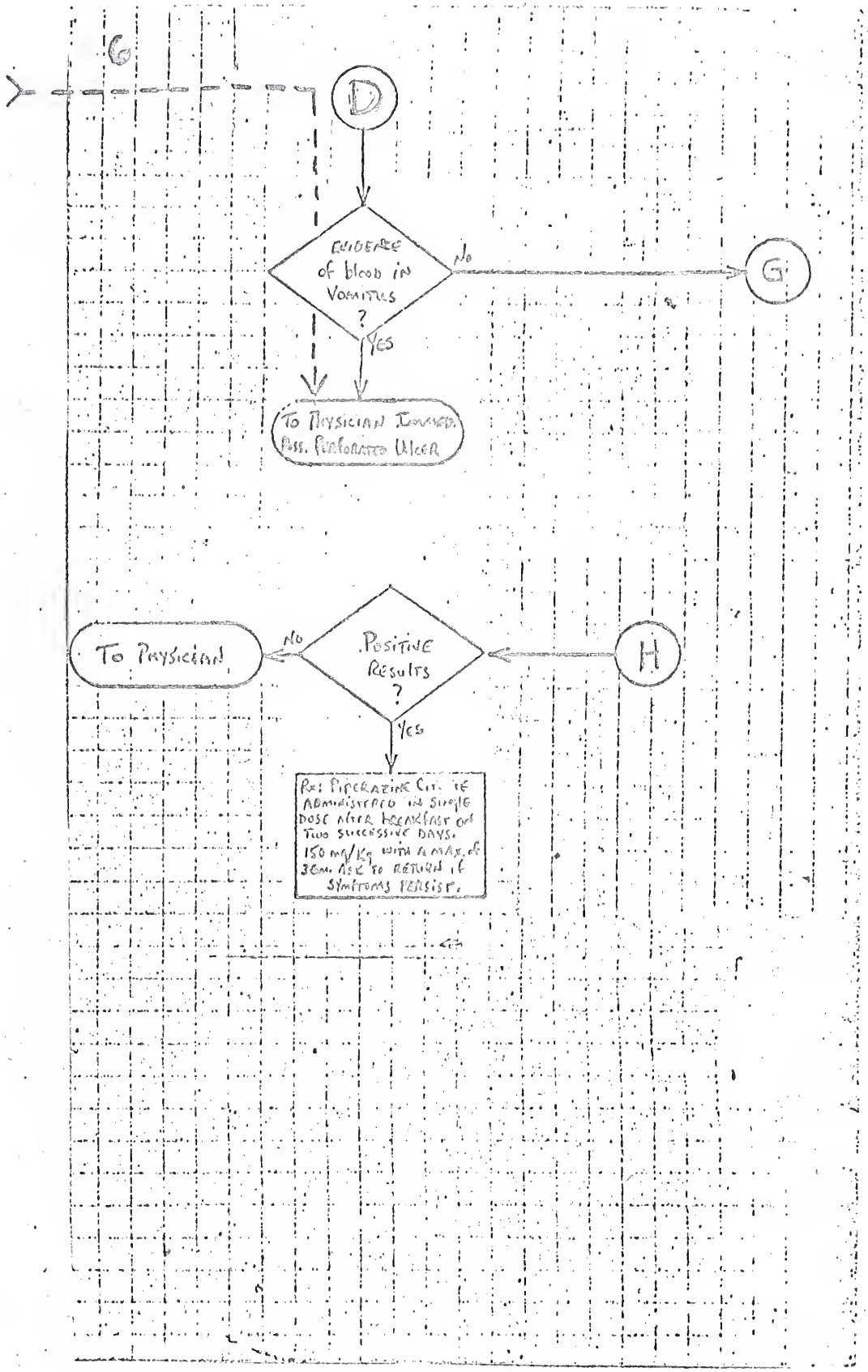

No
FEMALE ?
No
WEIGHT LOSS ?
No
Third or tenderness over bladder or in renal region, but no rigidity ?
Yes
B
Yes
Yes
Yes
No
A
Pain in both iliac regions and hypogastrium, radiating to lower back ?
No
Yes
To Physician
Poss. Acute Salpingitis
To Physician
Poss. Carcinoma of colon
Suspect Pyelitis or cystitis. Take urine culture. Do Gram Stain. Start appropriate Antibacterial therapy.
To. Physician
Yes
Colicky, Tenesmus ?
Yes
C
No
Tenderness, Rigidity
Yes
No
Tenderness over spine, other evidence of spinal disease ?
Yes
To Physician
Poss. Spinal Cord Disease
No
Yes
Aggravated by cough or deep breathing; other signs of respiratory ailment ?
No
To Physician Impend.
Hepatitis / Coronary Thrombosis
Rapid distention ?
Yes
To Physician Impend.
Poss Mesenteric Thrombosis
No
D


3
C
Pain radiates to right shoulder and/or back ?
YES
NO
Rebound rigidity or signs of general peritonitis ?
NO
YES
To Physician ... Poss. cholelithiasis
To Physician Immed. Poss. Perforated Ulcer
Frequent small stools of almost pure blood and some mucus ?
YES
NO
To Physician Amebic/bacillary dysentery
G
Generalized edema of face/body ?
NO
YES
Jaundice ?
YES
NO
Hepatomegaly and/or headache/pain on moving eyes ?
NO
YES
To Physician ... Poss. Cardiac Pancreatitis
To Physician Poss. Hepatitis


YES
NO
Dx: TRICHINIASIS
Rx: BED REST, ASPIRIN 0.6gm. ORALLY EVERY 4 HRS. OR CODEINE 15-30mg ORALLY EVERY 4 HRS.
TO PHYSICIAN
OCCURANCE IN SEVERAL PERSONS WHO HAVE CONSUMED THE SAME FOOD ?
YES
>24 HR DURATION OF DEHYDRATED CHILD ?
NO
YES
BED REST, WATER OR CARBONATED DRINKS, MEPERIDINE, 1A, EVERY 4-6 HRS. FOR SEVERE CRAMPS. RETURN IN 48 HRS. IF NOT IMPROVED
TO PHYSICIAN
Poss. Food Poisoning
NO
CONSTIPATION ?
NO
YES
LOSS OF WEIGHT ?
YES
SUSPECT ASCARIASIS
OBTAIN FECES SPECIMEN - EXAMINE FOR ASCARIS OVA.
NO
CHECK FOR HERNIA OR HISTORY OF EXISTING HERNIA
SENSATION of BURNING/ HEAVINESS IN EPIGASTRIUM ?
YES
Dx: ACUTE GASTRITIS
Rx: COMPLETE BED REST, NO SOLID OR SEMI-SOLID FOOD OR ICE DAY. DIMENHYDRINATE 50 to 100mg. ORALLY, 3 OR 4 TIMES/DAY. IF SEVERE PAIN MEPERIDINE, 50 to 100mg. ORALLY EVERY 4 HRS. TO PHYSICIAN
NO
Dx: INFLUENZA
Rx: BED REST, LIGHT DIET ASPIRIN 0.6gm. ALONE OR WITH CODEINE, 15 to 30mg. ORALLY EVERY 4 HRS.
HERNIA ?
YES
TO PHYSICIAN IMMED.
Poss. STRANGULATED HERNIA
NO
TO PHYSICIAN
Poss. ACUTE PANCREATITIS

APPENDIX IX


F
E
PAIN RADIATES TO RT. SHOULDER/BACK ?
YES
NO
CHRONIC DYSPEPSIA OR JAUNDICE ?
YES
NO
DX: IRRITABLE COLON
REASSURE TO RELIEVE THE DISORDER IS FUNCTIONAL AND NOT SERIOUS. REST AND RELAXATION, AIDED BY SEDATIVES (AT BEDTIME) - SUCH AS PHENOBARBITAL (GRAIN ½) - SHORT WALKS. TRY TO HAVE BOWEL MOVEMENT AT SAME TIME DAILY. USE NO LAXATIVES OR ENEMAS (IF NO BOWEL MOVEMENT OCCURS IN 3 DAYS, TAKE SALINE OR OIL ESSENTIAL) (ELSE, TO PHYSICIAN)
PAIN IN LOWER LEFT QUADRANT, RADIATES TO UMBILICAL AND PUBIC REGIONS ?
YES
TO PHYSICIAN IMMED. POSS. ACUTE DIVERTICULITIS
NO
HEMATEMESIS? PAIN ON MOVING EYES, OR DEEP JAUNDICE ?
YES
PAIN ON MOVING EYES ?
NO
TO PHYSICIANS POSS. CIRRHOSIS
YES
TO PHYSICIAN POSS. HEPATITIS
NO
PAIN IN RIGHT HYPOCHONDRIUM OR EPIGASTRIUM; MURPHY'S SIGN ?
YES
PYROSIS; IMMEDIATE REGURGITATION AFTER SWALLOWING FOOD ?
YES
SUSPECT HIATUS HERNIA. ORDER UPPER GI SERIES OF X-RAYS
NO
TO PHYSICIAN POSS. ACUTE CHOLECYSTITIS
NO
TENDERNESS IN RENAL REGION OR OVER BLADDER, BUT NO RIGIDITY ?
YES
SUSPECT PYELITIS OR CYSTITIS. TAKE URINE CULTURE. DO GRAM STAIN. START APPROPRIATE ANTIBACTERIAL THERAPY
NO
PAIN, VOMITING, NAUSEA ASSOCIATED WITH FOOD; HEMATEMESIS ?
NO
TO PHYSICIANS POSS. PYLORIC OBSTRUCTION
YES
SUSPECT PEPTIC ULCER. ORDER UPPER GI SERIES OF X-RAYS.
TO PHYSICIAN


6
D
EVIDENCE of blood in Vomitus ?
No
G
Yes
To Physician Immed. Poss. Perforated Ulcer
To Physician
No
Positive Results ?
H
Yes
Rx: Piperazine Cit. is administered in single dose after breakfast on two successive days. 150 mg/Kg with a max. of 3 Gm. Ask to return if symptoms persist.

Chi-square Discrimination (≧ 40) Acute MI vs. Pneumonia (40)

	Discriminating Signs and Symptoms	χ^2	Incidence Rates Percent		Indicating
			Acute MI	Pn	
1.	Pain ↑, respiration, present	351	4	81	Pn
2.	Cough and expectoration	268	11	80	Pn
3.	Pain, stabbing, knife-like, present	253	7	71	Pn
4.	Signs of consolidation on physical examination	205	2	51	Pn
5.	Pain, lateral chest, present	191	1	47	Pn
6.	Pain, retrosternal, present	171	68	9	Acute MI
7.	Lagging Hemithorax with respiration	151	1	37	Pn
8.	Absence of breath sounds on physical exam.	132	1	35	Pn
9.	Pain, numerous seizures daily, present	108	28	74	Pn
10.	Pain for days, present	106	14	55	Pn
11.	Pain radiation, left arm, hand, fingers, pres.	106	41	0	Acute MI
12.	Hemoptysis	106	2	32	Pn
13.	Respiratory rate ≧ 20	94	20	61	Pn
14.	Moist Basilar rales	91	21	61	Pn
15.	Pain, several hours, present	87	49	9	Acute MI
16.	Pain, constriction, tightness, present	76	38	4	Acute MI
17.	Pain radiation, back, present	73	7	36	Pn
18.	Temperature ≧ 101° F	71	21	56	Pn
19.	Pain, right anterior chest, present	63	4	27	Pn
20.	Pain, pressure-like, present	61	31	3	Acute MI
21.	Xray, pleural effusion	55	4	25	Pn
22.	Temperature elevation > 2 days	51	6	27	Pn
23.	Pain relieved by changing position, present	49	2	19	Pn
24.	Pain ↑, physical exertion, present	48	35	8	Acute MI
25.	Heart Rate > 100	48	11	35	Pn
26.	Fatigue	46	14	39	Pn

COMPUTER EVALUATION IN DIFFERENTIAL DIAGNOSIS OF CHEST PAIN (40)
from Pipberger et al.

Incidence Rates -- Old Myocardial Infarction

		Percent
1.	Pain ↑, physical exertion, present	71
2.	History of smoking	63
3.	Pain, retrosternal, present	63
4.	Pain ↑, physical exertion, past	63
5.	Dyspnea on exertion	61
6.	Pain, retrosternal, past	59
7.	Cholesterol ≥ 250	45
8.	Pain, several hours, past	45
9.	Pain, severe, present	43
10.	Pain radiation, left arm, hand, fingers, past	41
11.	Pain radiation, left arm, hand, fingers, present	41
12.	Orthopnea	39
13.	Fatigue	39
14.	Family history, Arteriosclerotic Heart Disease	38
15.	Pain, moderate, present	36
16.	Dizziness, fainting	36
17.	Pain, constriction, tightness, past	36
18.	Pain, constriction, tightness, present	35
19.	Pain duration, few minutes, present	34
20.	Seizures at irregular intervals, past	34
21.	Seizures at irregular intervals, present	32
22.	Numerous seizures daily, present	31
23.	Pain, pressure-like, present	29
24.	Peripheral edema	29
25.	Intensity of pain, excruciating, past	27
26.	Pain in extremities	27
27.	Pain, left anterior chest, present	25

COMPUTER EVALUATION IN DIFFERENTIAL DIAGNOSIS OF CHEST PAIN (40)

Incidence Rates -- Acute Myocardial Infarction

		Percent
1.	History of smoking	70
2.	Pain, retrosternal, present	68
3.	Sedimentation Rate $\geq$ 20	56
4.	WBC $\geq$ 10,000	54
5.	Pain, severe, present	53
6.	Cholesterol $\geq$ 250	52
7.	Pain, several hours, present	49
8.	Pain, radiation, left arm, hand, fingers, present	41
9.	Pain, constriction, tightness, present	38
10.	Family history, Arteriosclerotic Heart Disease	37
11.	Pain$\uparrow$, physical exertion, present	35
12.	Pain, pressure-like, present	31
13.	Dyspnea on exertion	29
14.	Pain, numerous seizures daily, present	28
15.	Intensity of pain -- moderate, present	27
16.	Pain radiation, left shoulder, present	26

COMPUTER EVALUATION IN DIFFERENTIAL DIAGNOSIS OF CHEST PAIN (40)

Incidence Rates -- Pneumonia

		Percent
1.	Pain ↑, respiration, present	81
2.	Cough and expectoration	80
3.	Pain, numerous seizures daily, present	74
4.	Sedimentation Rate $\geq$ 20	73
5.	History of Smoking	72
6.	Pain, stabbing, knife-like present	71
7.	Moist basilar rales	61
8.	Respiratory rate $\geq$ 20	61
9.	Temperature $\geq$ 101° F.	56
10.	Pain for days, present	55
11.	Dyspnea on exertion	55
12.	Signs of consolidation on physical examination	51
13.	WBC $\geq$ 10,000	51
14.	Pain, lateral chest, present	47
15.	Pain, severe, present	43
16.	Fatigue	39
17.	Pain, moderate, present	38
18.	Lagging of hemithorax with respiration	37
19.	Pain radiation, back, present	36
20.	Hemoptysis	32
21.	Temperature elevation - 1-2 days	31
22.	Pain, right anterior chest, present	27
23.	Temperature elevation $\geq$ 2 days	27
24.	Xray, pleural effusion	25

COMPUTER EVALUATION IN DIFFERENTIAL DIAGNOSIS OF CHEST PAIN (40)

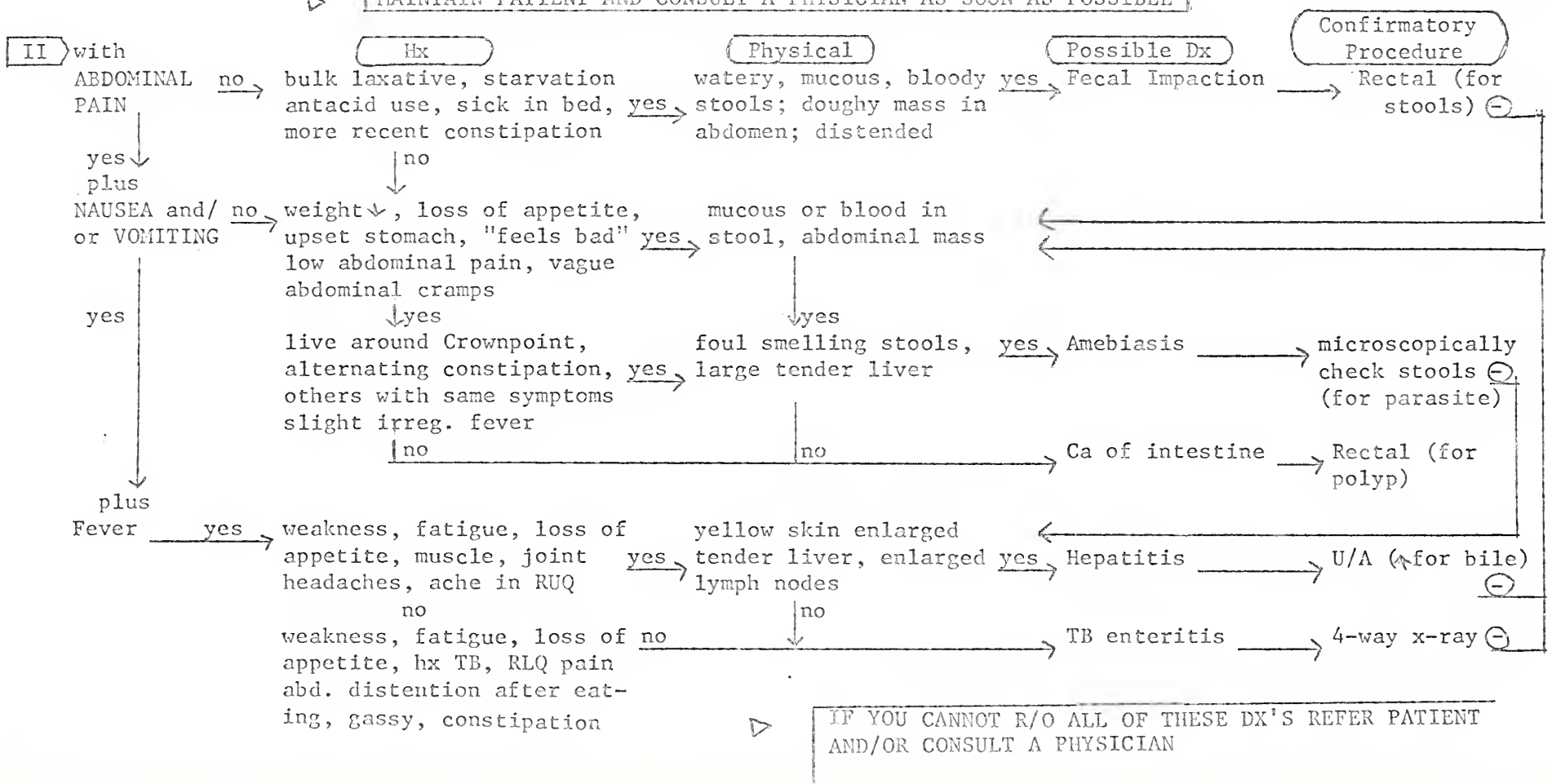
	Incidence Rates -- Angina Pectoris	Percent
1.	Pain, retrosternal, present	66
2.	Dyspnea on exertion	66
3.	History of smoking	66
4.	Pain↑, physical exertion, past	53
5.	Pain, severe, present	53
6.	Cholesterol ≥ 250	48
7.	Pain, few minutes, present	46
8.	Pain, numerous seizures daily, present	43
9.	Pain, retrosternal, past	42
10.	Pain, constriction, tightness, present	41
11.	Fatigue	41
12.	Family history, Arteriosclerotic Heart Disease	40
13.	Dizziness, fainting	37
14.	Pain, few minutes, past	35
15.	Orthopnea	35
16.	Sedimentation Rate ≥ 20	35
17.	Pain, moderate, present	33
18.	Pain, radiation, left shoulder, present	33
19.	Pain, pressure-like, present	33
20.	Pain at irregular intervals, past	31
21.	Pain radiation, left arm, hand, and fingers, present	31
22.	BP systolic > 180	30
23.	Pain, constriction, lightness, past	29
24.	Pain at irregular intervals, present	29
25.	Pain, left anterior chest, present	27
26.	Peripheral edema	25

DIARRHEA

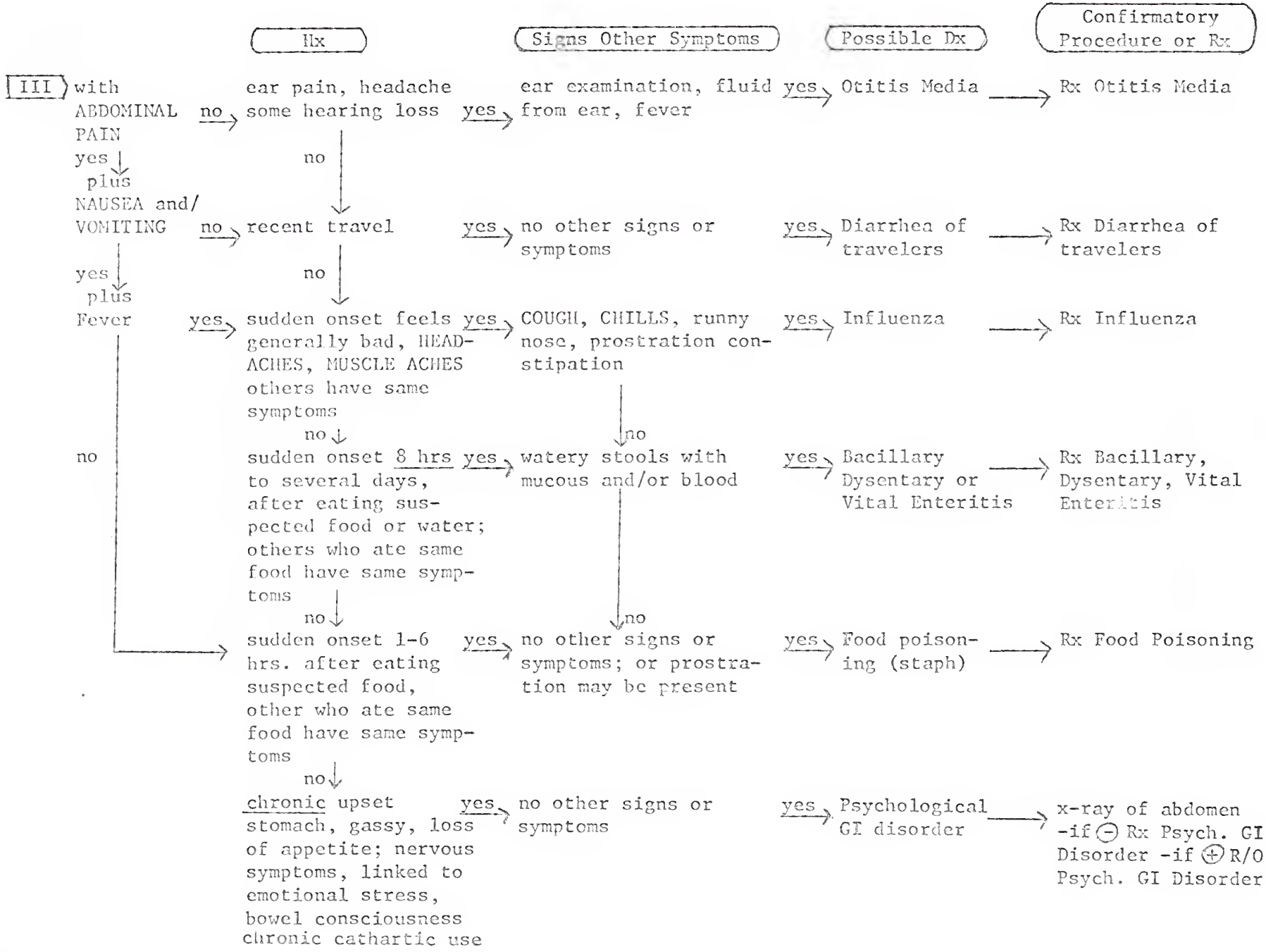
Data Base: Hx: onset of symptoms, duration, time course; change in bowel habits; suspected food eaten recently; DIARRHEA present in contacts, recent travel, TB, alcohol use, drug use.
Physical: Inspection, auscultation, percussion, palpation of abdomen, vital signs - T, R, P, b.p.
Lab: Inspection of stools - gross

I if signs of Shock - cool moist skin; low b.p.; weak, fast pulse.
Dehydration - flushed skin, mucous membranes; tenting of skin, thirst, sunken fontanels, lack of tears hx wt. loss, decrease in urine out put.
Electrolyte Imbalance - weakness of muscles, cardiac arrhythmias, ↑ or ↓ respiration (rate, depth), dulling of consciousness, stupor, hallucinations.

▷ MAINTAIN PATIENT AND CONSULT A PHYSICIAN AS SOON AS POSSIBLE



▷ IF YOU CANNOT R/O ALL OF THESE DX'S REFER PATIENT AND/OR CONSULT A PHYSICIAN


Hx
Signs Other Symptoms
Possible Dx
Confirmatory Procedure or Rx
III
with ABDOMINAL PAIN
yes
plus
NAUSEA and/ VOMITING
yes
plus
Fever
no
ear pain, headache some hearing loss
yes
ear examination, fluid from ear, fever
yes
Otitis Media
Rx Otitis Media
no
recent travel
yes
no other signs or symptoms
yes
Diarrhea of travelers
Rx Diarrhea of travelers
no
sudden onset feels generally bad, HEADACHES, MUSCLE ACHES others have same symptoms
yes
COUGH, CHILLS, runny nose, prostration constipation
yes
Influenza
Rx Influenza
no
sudden onset 8 hrs to several days, after eating suspected food or water; others who ate same food have same symptoms
yes
watery stools with mucous and/or blood
yes
Bacillary Dysentary or Vital Enteritis
Rx Bacillary, Dysentary, Vital Enteritis
sudden onset 1-6 hrs. after eating suspected food, other who ate same food have same symptoms
yes
no other signs or symptoms; or prostration may be present
yes
Food poisoning (staph)
Rx Food Poisoning
chronic upset stomach, gassy, loss of appetite; nervous symptoms, linked to emotional stress, bowel consciousness chronic cathartic use
yes
no other signs or symptoms
yes
Psychological GI disorder
x-ray of abdomen -if ⊖ Rx Psych. GI Disorder -if ⊕ R/O Psych. GI Disorder

BAIN AND SPAULDING: CODING SYMPTOMS (44)

Causes of Abdominal Pain

		Percent
Structural		
All causes except peptic ulcer, gallbladder disease	22	
Peptic ulcer	19	45
Gallbladder disease	4	
Non-structural		
Psychiatric	28	
Spastic colon	6	40
Other functional gastrointestinal disorders	6	
Undetermined		15
Total		100

Causes of Back Pain

Musculoskeletal	44
Psychiatric	22
Undetermined	13
Genitourinary	8
Remainder	13
Total	100

Causes of Cough

Respiratory	85
Cardiovascular	5
Psychiatric	2
Remainder	8
Total	100

BAIN AND SPAULDING: CODING SYMPTOMS (44)

Causes of Chest Pain

	Percent
Cardiovascular	33
Psychiatric	26
Respiratory	12
Musculoskeletal	12
Remainder	17
Total	100

Causes of Dyspnea

Cardiovascular	47
Respiratory	32
Psychiatric	10
Remainder	11
Total	100

Causes of Nervousness

Psychiatric	85
Thyrotoxicosis	8
Remainder	7
Total	100

Causes of Headache

Psychiatric	53
Undetermined	13
Cerebrovascular (including migraine)	12
Respiratory (chiefly upper)	10
Remainder	12
Total	100

BAIN AND SPAULDING: CODING SYMPTOMS (44)

Causes of Dizziness

	Percent
Psychiatric	40
Undetermined	16
Cerebrovascular	12
Cardiovascular	9
Aural	8
Neurological	5
Remainder	10
Total	100

Causes of Fatigue

Psychiatric	50
Undetermined	10
Endocrine	9
Cardiovascular	8
Respiratory	8
Hematological	7
Carcinoma-various sites	3
Gastrointestinal	2
Renal	2
Obesity	1
Arthritic	1
Malnutrition	1
Total	100

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